HOYA CORPORATION OPTICS SECTION

Color Filter Glass

HOYA CORPORATION OPTICS SECTION manufactures and markets color filter glass with wide-range spectral characteristics covering the ultraviolet to infrared region, with world-leading manufacturing technology and under stringent quality control.

These color filter glasses are used for all types of high-technology industries including cameras/optical instruments, physical and chemical appliances, educational materials, electronic instruments, optoelectronic instruments, medical appliances, optical industrial equipment, and many other industrial equipment, where they have earned a reputation for excellence.

This catalog has been compiled to present conventional and newly developed glass types incorporating spectral characteristics and other important properties to provide practical and technical information.

We look forward to your continued patronage.

October, 2020

Contents

1. List of Color Filter Glass Types

Classification	Glass type	Principal characteristic	Application (reference)
Sharp Cut Filters		Transition wavelength	For industrial use
	L37	370 nm	
	L38	380 nm	
	L39	390 nm	
	L42	420 nm	
	Y44	440 nm	
	Y48	480 nm	
	Y50	500 nm	
	Y52	520 nm	
	O54	540 nm	
	O56	560 nm	
	O58	580 nm	
	R60	600 nm	
	R62	620 nm	
	R64	640 nm	
	R66	660 nm	
Infrared Transmitting Filters	R70	700 nm	Surveillance Camera and Other Purposes
	R72	720 nm	
	IR76N	760 nm	
	IR80N	800 nm	
	IR83N	830 nm	
	IR85N	850 nm	
	RM90	900 nm	
	RM100	1200 nm	
		Wavelength of maximum transmittance	
Infrared Band Pass	RT830	830 nm	
Sharp Cut Filters (W Series)		λτ 0.5 (wavelength when τ is 0.5)	For industrial use
	W-L420	420 nm	
	W-Y435	435 nm	
	W-Y455	455 nm	
	W-Y475	475 nm	
	W-Y495	495 nm	
	W-Y515	515 nm	
	W-O530	530 nm	
	W-O550	550 nm	
	W-O570	570 nm	
	W-O590	590 nm	
	W-R610	610 nm	
	W-R630	630 nm	
	W-R645	645 nm	
	W-R665	665 nm	
	W-R695	695 nm	
	W-R715	715 nm	
	W-IR760	760 nm	
	W-IR780	780 nm	
	W-IR800	800 nm	
	W-IR830	830 nm	
	W-IR850	850 nm	
UV Filters	UV28N	280 nm	
	UV30N	300 nm	
	UV32N	320 nm	
	UV34N	340 nm	
	UV36N	360 nm	
Blue Filters		Wavelength of maximum transmittance	
	B370	370 nm	
	E-B390	390 nm	
	B410	410 nm	
	B440	440 nm	
	B460	460 nm	
Green Filters			
	G530	530 nm	
	G533	533 nm	
	G545	545 nm	
	G550	550 nm	

Classification	Glass type	Principal characteristic	Application (reference)
Light Balancing Filters		Color temperature conversion ability	Color temperature conversion
	LA20	20	
	LA40	40	
	E-LA80	80	
	E-LA100	100	
	E-LA120	120	
	E-LA140	140	
	E-LA200	200	
	LB20	-20	
	LB40	-40	
	LB80	-80	
	LB100	-100	
	LB120	-120	
	LB140	-140	
	LB200	-200	
Near-infrared Absorbing Filters (color compensating filters)	C500S CM500 C5000 CD700 CM700	Near-infrared Absorbing Filters	Images/color compensation
Neutral Density Filters	ND0 ND0.1 ND0.3 ND1 ND3 ND5 ND10 ND13 ND15 ND20 ND25 ND30 ND40 ND50 ND60 ND70 ND80	Dimmer Filter High intensity control	Industrial use/images
Neutral Density Filter (W-ND Series)	W-ND9 W-ND3 W-ND4 W-ND5 W-ND11	Dimmer Filter High intensity control	Industrial use/images
Heat Absorbing Filters	HA5 HA15 HA30 HA50	Heat absorbing	For industrial use
Ultraviolet Transmitting, Visible Absorbing Filters	U330 U340 U360 UL254S UL365S	Bandpass	For industrial use
Multiband Calibration Filters	V10 V11 HY1		For industrial use

2. Properties of Color Filter Glass

2.1 Optical Properties

2.1.1 Transmittance

There are 2 kinds of transmittances in this catalog, one is transmittance (T) and the other is internal transmittance (τ). The relationship between these 2 transmittances is shown as follows:
Transmittance (T(λ))=P(λ) τ(λ)

P(λ): Reflection coefficient at wavelength is λ

$$P(\lambda)=\frac{2n(\lambda)}{(n(\lambda)^2+1)}$$

n(λ): Refractive index at wavelength is λ

In this catalog, refractive indexes corresponding to wavelengths ranging between 400 nm and 1000 nm with the 100 nm pitches are shown, and any refractive index in the range can be simply calculated by the least squares method or others.
Internal transmittances are calculated from the refractive indexes.

The internal transmittance is important to estimate the transmittance when the thickness is changed. The internal transmittances for various thicknesses can be calculated by the formula as follows:

$$\tau 2(\lambda)=\tau 1(\lambda)^{\frac{t2}{t1}}$$

τ1(λ) : Internal transmittance when filter thickness is τ1 and wavelength is λ
τ2(λ) : Internal transmittance when filter thickness is τ2 and wavelength is λ

The internal transmittance can be simply converted to the transmittance, and therefore, the spectral transmittance characteristics in the case of change in the thickness are also simply available.
• Estimated transmittances by calculation include errors caused by various reasons. To acquire an accurate transmittance in the case of change in the thickness, actual measurement with the thickness changed is necessary.

The standard thickness is described as "Catalog Thickness" in this catalog, and the transmittance characteristics described in this catalog are based on catalog thickness.
If the thickness is changed, the property value changes, too.
The transmittance characteristic values shown in the catalog indicate measures of central tendency of production lots.

• In the catalog, transmittances from 200 nm through 1200 nm and transmittance curves from 200 nm through 5000 nm are shown.
• The transmittance values with 1300 nm or higher are reference values.

2.1.2 Optical Density(OD)

The characteristics of color filter glass may be represented by its optical density. The relationship between the optical density and transmittance is shown as follows:

$$D(\lambda)=\log\left(\frac{1}{\tau(\lambda)}\right)$$

2.1.3 Chromaticity Coordinates

Chromaticity coordinates are obtained in accordance with JIS Z8701 (1999) and JIS Z8722 (2009).
Standard illuminants A, C, and D65 and auxiliary standard illuminant are used as an illuminant in accordance with JIS Z8720 (2012).
The specifications described above are in conformity with ISO/CIE10526:1991, ISO/CIE10527:1991, CIE15:2004, and CIE63:1984.
The chromaticity diagram shows typical glass types with standard illuminants A and D65 and auxiliary standard illuminant C.
• This catalog shows the chromaticity coordinates when the viewing angle is 2 degrees.

2.1.4 Refractive Index(n)

Refractive indexes corresponding to wavelengths ranging between 400 nm and 1000 nm with the 100 nm pitches are shown to the third decimal place.
• Refractive indexes shown in this catalog are reference values.

2.1.5 Temperature Coefficient of Transmittance (ΔλT)

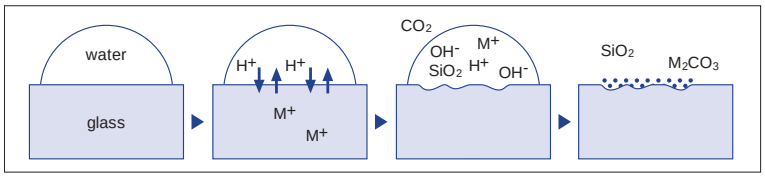
Refractive indexes corresponding to wavelengths ranging between 400 nm and 1000 nm with the 100 nm pitches are shown to the third decimal place.
• Refractive indexes shown in this catalog are reference values.

Glass type	ΔλT
L42/W-L420	0.08
Y44/W-Y435/W-Y455	0.08
Y48/W-Y475/W-Y495	0.10
Y50/W-Y515	0.11
Y52/W-O530	0.13
IR80N/W-IR800	0.20
IR83N/W-IR830	0.22
IR85N/W-IR850	0.23
RM90	0.21
RM100	0.25

Glass type	ΔλT
O54/W-O550	0.12
O56/W-O570	0.12
O58/W-O590	0.13
R60/W-R610	0.14
R62/W-R630	0.14
R64/W-R645	0.15
R66/W-R665	0.16
R70/W-R715	0.17
R72	0.19
IR76N/W-IR760	0.19

2.2 Chemical properties

Dimming or staining may be observed on the glass surface in the polishing or coating process or during storage.
As the measure indicating the trend of these phenomena, dimming is caused by water durability and staining is caused by acid durability.
● Dimming
Polished glass exposed to high humidity or temperature variation may sweat. Water vapor may condense to form droplets on the glass surface. Some of the glass components that dissolve in the droplets may in turn attack the glass surface and react with gaseous elements in the air such as CO_2. Reaction products form as white spots or a cloudy film as the glass surface dries. This phenomenon is called dimming.

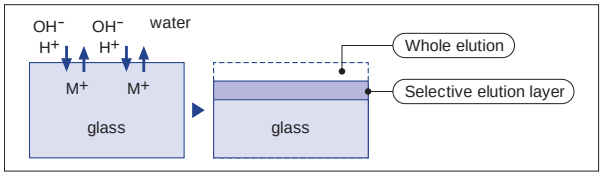


The difficulty degree of dimming generation is evaluated with the water durability by the powdered method (Dw).

● Staining

The surface of a polished optical glass product is damaged by water or acid, and the reflected light of interference colors can sometimes be observed on the surface. This phenomenon is called staining.

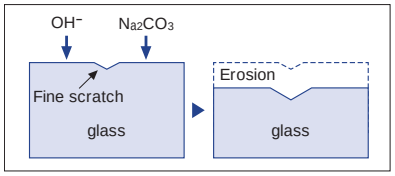
Water or acid contact causes a chemical reaction, which is ion exchange between cations in the glass and hydronium ions in water, resulting in a silica-rich surface layer that causes an interference color at the layer.



The resistance to staining be evaluated with the acid durability by the powdered method (DA) or the staining resistivity by the surface method.

● Latent scratch

Fine scratches created on the glass surfaces during the polishing process may become large and visible after surfaces are eroded by inorganic builders included in cleaning detergents. This phenomenon is called latent scratch.



Erosion in the solution of inorganic builders has 2 types: one is that the builders such as Na_2CO_3 are hydrolyzed and hydroxide ions are generated, which erode the glass, and the other is that hydrolyzed polymerized phosphoric ions such as polymerized phosphate builders erode the glass.

2.2.1 Water Durability (D_W)

The powdered glass (particle size: 425 to 600μm), weighed by its specific gravity, is placed in a platinum net basket and soaked in 80 ml pure water (pH: 6.5 to 7.5), which is contained in a round-bottom flask made of quartz glass. The glass is then boiled for 60 minutes and classified according to the percentage of weight loss (%).

Class	Reduction in weight (%)
1	<0.05
2	≧ 0.05 to < 0.10
3	≧ 0.10 to < 0.25
4	≧ 0.25 to < 0.60
5	≧ 0.60 to < 1.10
6	≧ 1.10

2.2.2 Acid Durability (DA)

As the same method as the DW measurement, 0.01 mol/liter of nitric acid aqueous solution is put into the flask and classification is performed according to the percentage of weight loss (%) as follows:

Class	Reduction in weight (%)
1	<0.2
2	≧ 0.2 to < 0.35
3	≧ 0.35 to < 0.65
4	≧ 0.65 to < 1.20
5	≧ 1.20 to < 2.20
6	≧ 2.20

2.3 Thermal properties

2.3.1 Transition Temperature (Tg)

The glass transition temperature (Tg) refers to the temperature at which the glass transforms from the "glassy state" (at the lower temperature side) to the "supercooled liquid state" (at the higher temperature side).

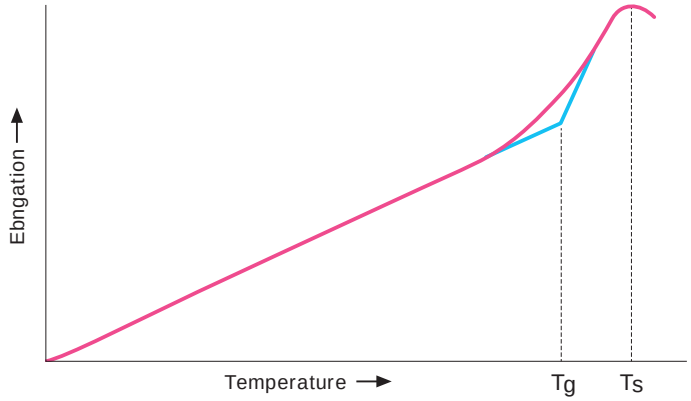
With use of a differential thermal dilatometer whose temperature distribution within its furnace is ±1°C, the corresponding temperature is defined as the transition temperature on the thermal expansion curve indicating the relationship between the temperature and expansion, which is acquired when the the well-annealed test specimen is heated at a constant rate of 4°C/minute.

For the higher temperature line, we consider the value at which the gradient (differential value) is the highest, and for the lower temperature line, we determine a value 100°C below Tg. The unit for the transition temperature is °C.

This temperature is regarded as the temperature equivalent to the viscosity of approximately 1013 to 1014 dPa•s, and is a guideline for the retention temperature for annealing.

It can be also used as an indicator for temperature control at coating.

Note: 1 dPa•s = 1 poise



Thermal expansion curve

2.3.2 Sag Temperature (Ts)

The temperature at which expansion stops apparently on the thermal expansion curve is defined as the sag temperature (Ts). This temperature is regarded as the temperature equivalent to the viscosity of approx. 1010 to 1011 dPa•s.

This phenomenon does not demonstrate the thermal expansion property essential to glass, but results from the deformation caused by the load applied to the glass specimen and the self weight of the glass specimen.

2.3.3 Mean Coefficient of Linear Thermal Expansion (α)

The coefficient of thermal expansion is indicated by αn for the normal temperature range (-30°C to 70°C) and αh for the high temperature range (100°C to 300°C), respectively, and expressed by 10-7/K.

An interference-dilatometer for the normal temperature range and a differential thermal dilatometer for the high temperature range are used as measurement instruments.

The coefficients of thermal expansion αn and αh are obtained by the formulas as follows:

$$\alpha_n = \frac{dL_n}{L \times dT_n}$$

Where, dTn is a temperature difference between -30 to 70°C (K), L is the initial length of the sample (mm), and dLn is the amount (mm) of the change in the sample length from -30°C to 70°C.

$$\alpha_h = \frac{dL_h}{L \times dT_h}$$

Where, dTh is a temperature difference between 100 to 300°C (K), L is the initial length of the sample (mm), and dLh is the amount (mm) of the change in the sample length from 100°C to 300°C.

2.4 Mechanical Properties

2.4.1 Knoop Hardness (H_K)

The Knoop hardness is calculated by the following formula after applying the load of 0.9807 N to the polished glass surface for 15 seconds with use of a pyramid-shaped diamond indenter with the angle between opposite edges of 172°30' and 130° and measuring the longer diagonal line of the indentation.

$$H_k = 1.451 \times \frac{F}{l^2}$$

Where F is the load (N) and l is the length of the longer diagonal line (mm) of the indentation.
Note 1: Knoop hardness is expressed in MPa or N/mm^2, which is omitted by custom.
Note 2: The H_K value obtained by the above formula using SI units is equal to the one obtained by the calculation using conventional kgf units.
Note 3: $1N = 1.01972 \times 10^{-1}kgf$
Note 4: Both measured values and classes identified therefrom are shown in the table below.

Class	Knoop hardness
1	<150
2	≧ 150 to < 250
3	≧ 250 to < 350
4	≧ 350 to < 450
5	≧ 450 to < 550
6	≧ 550 to < 650
7	≧ 650

2.4.2 Abrasion Factor (FA)

The glass sample with 9 cm^2 of area to be measured is placed 80 mm from the center of the cast iron circular plate that is rotated horizontally at 60 r.p.m., and is lapped by applying the load of 9.807 N with uniformly supplying the lapping liquid made by putting 10 g of alumina abrasive grains with average diameter of 20µm in 20 ml of water for 5 minutes. The abrasive weight, m, is acquired by comparing the sample weights between before and after lapping.
Similarly, the abrasive weight, m_0 of the standard specimen (BSC7) specified by the Japan Optical Glass Manufacturers' Association is measured and the abrasion factor (FA) is calculated by the formula as follows:

$$F_A = \frac{m/d}{m_0/d_0} \times 100$$

Where d is the specific gravity of the test specimen and d_0 is the specific gravity of the standard specimen (BSC7).
In other words, the value calculated by the formula above is the speed of sandblast abrasion with respect to BSC7 as 100.

2.5 Other Properties

2.5.1 Specific Gravity (d)

The specific gravity of glass is defined relative to the density of pure water at 4°C.

2.5.2 Fluorescence

Color filter glass in particular may produce fluorescence under ultraviolet irradiation.
Especially, sharp cut filters produce fluorescence in the visible range.

2.5.3 Environmental Impact Substances

Color filter glasses partly include hazardous substances specified by RoHS Directive , but those substances are exempt from application according to the Exemption List Annex Ⅲ.
The information on the specified hazardous substances related to inclusion is shown in the table on the next page. Contact our sales personnel for further information.

The environmental hazardous substance content table of colored glass

Glass Type	As2O3	CdO	PbO	Cr2O3
L37			○	
L38			○	
L39			○	
L42		○		
Y44		○		
Y46		○		
Y48		○		
R64		○		
R66		○		
R68		○		
R70		○		
R72		○		
IR76N		○		
IR80N		○		
IR83N		○		
IR85N		○		
RM90			○	○(*1)
RM100			○	○(*1)
RT830		○		
W-L420		○		
W-Y435		○		
W-Y455		○		
W-Y475		○		
W-Y495		○		
W-Y515		○		
W-O530		○		
W-O550		○		
W-O570		○		
W-O590		○		
W-R610		○		
W-R630		○		
W-R645		○		
W-R665		○		
W-R695		○		
W-R715		○		
W-IR760		○		
W-IR780		○		
W-IR800		○		
W-IR830		○		
W-IR850		○		

Glass type	As2O3	CdO	PbO	Cr2O3
U350	○		○	
U360	○		○	
B370	○		○	
B440			○	
B460	○		○	
G530	○		○	○(*1)
G533	○		○	○(*1)
G545	○		○	○(*1)
G550	○		○	○(*1)
LA20	○		○	
LA40	○		○	
LB20	○		○	
LB40	○		○	
LB60	○		○	
LB80	○		○	
LB100	○		○	
LB120	○			
LB140	○			
LB200	○			
V10	○			

*1 Hexavalent chromium of several ppm - about 100 ppm exists on the manufacture melted at high temperature (analytical value).

3. Quality of Color Filter Glass

We use the method, "Internal Absorption", of glass as opposed to the vapor deposition type to achieve selective transmission and selective absorption. This is the greatest feature of our products.
With the vapor deposition type, the light of unnecessary wavelength is "reflected" which may cause adverse effects in the optical system.
In such a case, our "Internal Absorption" type is best suited for the high-precision optical system. The quality standard is managed and administered in accordance with the global standard, ISO10110.

3.1 Spectral Characteristics

The spectral transmittances in this catalog are the measures of central tendency.
The characteristics for each melting lot vary within the specifications, but variations in a lot are extremely small.

3.2 Optical Constant

The absorption coefficients and refractive indexes in this catalog are reference values, and they are necessary at coating.

3.3 Thickness

The thicknesses in this catalog are standard. Although the thickness can be changed be aware that the optical characteristics will also change.

3.4 Appearance and Internal Quality

Color filter glasses are manufactured with the aim of achieving the same quality as optical glasses. But the quality standards are different between them because of difference in melting methods.
It is hard to eliminate all the small bubbles and striae at glass melting, and some of them may remain at the permissible level.

3.4.1 Polished Products

We provide products appropriate to required quality in accordance with ISO10110-3.

3.4.2 Sliced Products

These are the semi-finished products that were cut from materials.
These products are classified by the total sum of cross sections of foam/foreign substances per 100 ml of a material as follows:

Classes of Bubbles and Inclusions	
Bubble class	**Total cross sectional area per 100ml of glass (mm2)**
0	<0.03
1	≧ 0.03 - < 0.10
2	≧ 0.10 - < 0.25
3	≧ 0.25 - < 0.50
4	≧ 0.50

3.5 Polishing Accuracy

The polishing accuracy will be in accordance with requests and applications.

4. Product Specifications of Color Filter Glass

4.1 Polished Products

These are the products that were formed and polished.

4.2 Sliced Products

These are the products that were cut from materials.

4.3 Coated Products

We carry coated products.
Antireflective coating has the effect of preventing dimming and staining.
We also offer the vapor deposition type depending on the customer's request.

4.4 Tempered Glass Products

There are 2 types of tempering; one is chemical tempering, and the other is thermal tempering.
Support in response to applications and glass composition is available.
Both types of tempering generate a stress in the glass that may affect the transmitted wave surface.

4.5 Special-Purpose Products

We may provide other products that are not listed in the catalog, and therefore, please contact our sale personnel.

5. Preservation and Handling

Color filter glass may be effected by conditions such as temperature, humidity, and sunlight. Storage for a long time, dimming, staining, or decrease in transmittance by solarization caused by ultraviolet rays may occur.

Before use after storage for months, it is recommended to check the product.

The storage conditions to be recommended are humidity of 50% or less and the temperature of 25 degrees C±5 degrees. Store the product in a dark place as well.

Sudden temperature change, for example inside and outside of a room in winter, may cause condensation on the surface.

Be careful about condensation when the product is integrated into an optical system.

6. Orders and Inquiries

When placing an order, please let us know the following:
Dimensions, thickness, tolerance (by drawing as much as possible), quantity, requested date for delivery, etc.
The optical characteristics and data on the catalog are subject to change due to modification without prior notice.

Explanation as to Data Tables

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Transmittance (T) or Internal Transmittance(τ)

Thickness mm

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T or τ																				
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T or τ																				
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T or τ																				
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T or τ																				
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T or τ																				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n							
K							
P							

Classes of Bubbles and Inclusions

Bubble Class

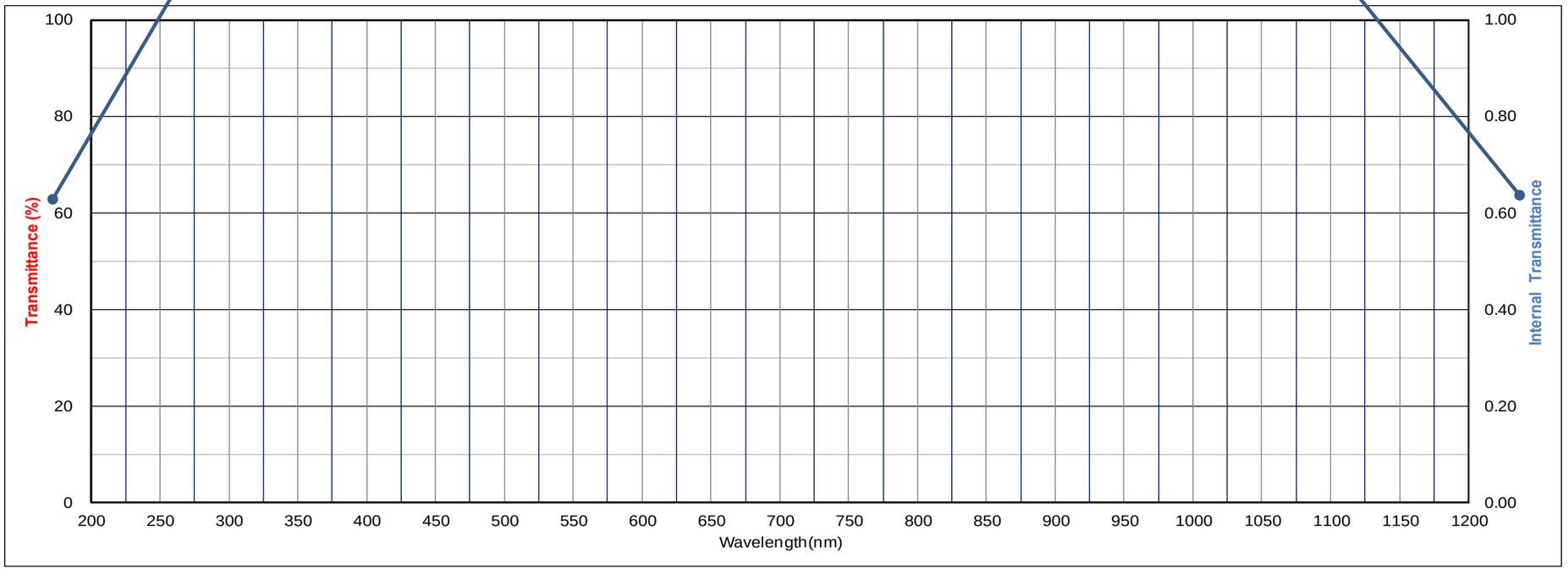
Color Specification

	x	y	Y	λ_d	P_e
A					
C					
D65					

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d

Tolerance of Transmittance (τ)



All data is mean values of various melts.

The content of this catalog is accurate as of October 2020

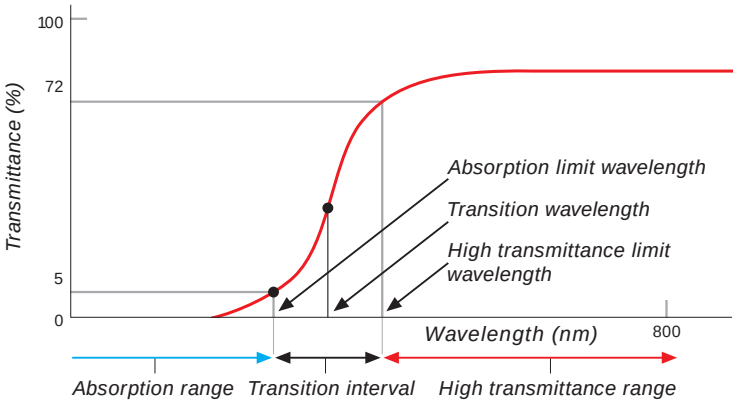
① Glass type
② Thickness stated in this catalog
③ Wavelength(nm)
④ Transmittance(%) "T"
Transmittance including reflection loss
or
Internal transmittance (-) "τ "
made correction of surface reflection
(for Sharp-cut filter W-series)
⑤ Bubble class
⑥ Refractive index for each wavelength
⑦ Absorption coefficient for each wavelength
⑧ Reflection factor for each wavelength
⑨ Color specifications based on standard illuminant
"A", "C", and "D65"
x,y : Chromaticity coordinates
Y : Tristimulus value
λd: Dominant wavelength
Pe: Excitation purity
⑩ Chemical properties
Dw : Water durability
Da : Acid durability
⑪ Thermal properties
Tg : Transformation temperature
Ts : Sag temperature
α : Coefficients of liner thermal expansion
⑫ Mechanical properties
Hk : Knoop hardness
FA : Abrasion factor
⑬ Other properties
d : Specific gravity
⑭ Tolerances of transmittance specified for each glass type
⑮ Transmittance curve including reflection loss
Red line / Left scale
⑯ Internal transmittance curve
Blue line / Right scale

Sharp Cut Filters

Sharp cut filters include glass types from L37 through R68 that can cover the visible region from 370 nm through 680 nm. Capital letters of glass types, L, Y, O, and R indicate the color tones of the transmission threshold wavelengths. Those are Colorless, Yellow, Orange, and Red, respectively.

The 2-digit value after the capital letter roughly indicates the transmission threshold wavelength. For example, Y48 indicates that the transmission threshold wavelength is approximately 480 nm and the filter is yellow in color.

Sharp cut filters can be manufactured by aiming other than the transmission threshold wavelengths shown in the catalog.



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Thickness 2.50 mm

L37

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	15.8	47.2	68.3	78.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	83.5	85.9	87.0	87.7	88.0	88.2	88.4	88.5	88.5	88.6	88.6	88.7	88.7	88.7	88.8	88.8	88.8	88.9	88.9	88.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.9	88.9	89.0	88.9	89.0	89.0	89.0	89.1	89.1	89.2	89.1	89.2	89.2	89.2	89.2	89.2	89.2	89.3	89.3	89.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.3	89.1	89.2	89.2	89.3	89.3	89.3	89.3	89.4	89.4	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	89.8	90.0	90.0	90.0	90.0	90.1	90.0	90.0	90.1	90.0	90.1	90.1	90.2	90.2	90.2	90.2				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.605	1.588	1.580	1.575	1.572	1.570	1.569
P	0.898	0.902	0.904	0.905	0.906	0.906	0.907

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

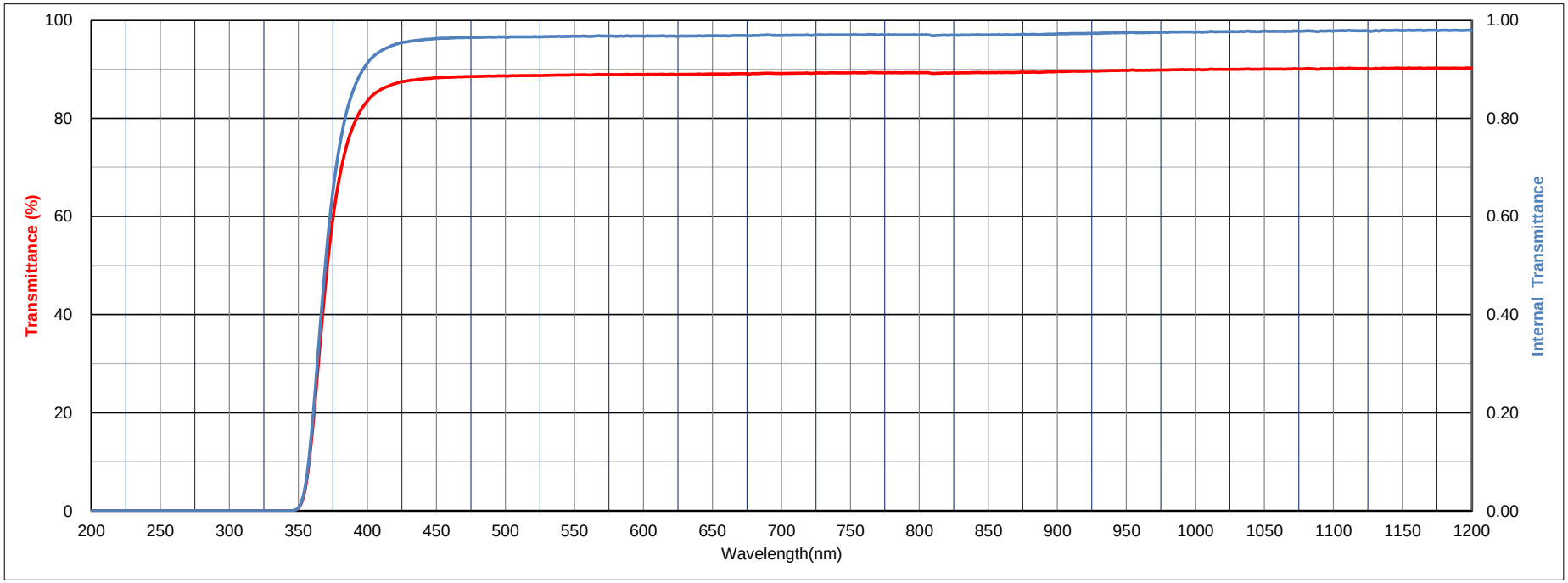
	x	y	Y	λ_d	P_e
A	0.448	0.408	89	583	1
C	0.311	0.317	89	573	0
D65	0.313	0.330	89	572	0

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	440	490	94	103	460	170	3.26

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
370±5	<35	>85



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The content of this catalog is accurate as of October ,2020

HOYA

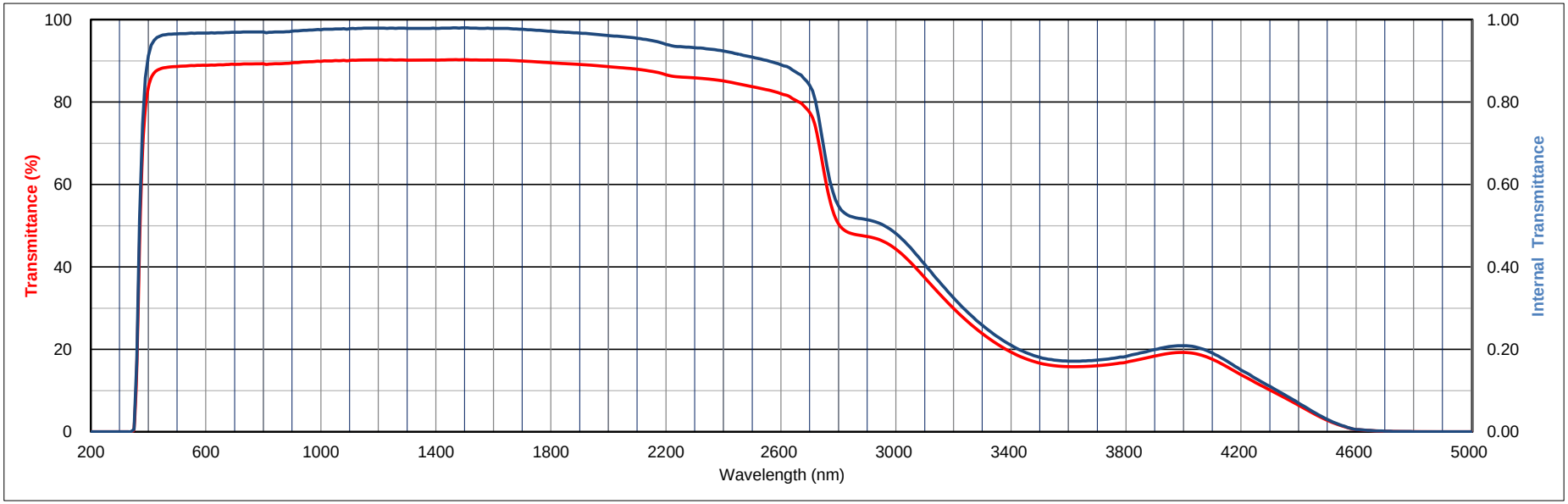
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L37

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	15.8	47.2	68.3	78.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	83.5	85.9	87.0	87.7	88.0	88.2	88.4	88.5	88.5	88.6	88.6	88.7	88.7	88.7	88.8	88.8	88.8	88.9	88.9	88.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.9	88.9	89.0	88.9	89.0	89.0	89.0	89.1	89.1	89.2	89.1	89.2	89.2	89.2	89.2	89.2	89.2	89.3	89.3	89.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.3	89.1	89.2	89.2	89.3	89.3	89.3	89.3	89.4	89.4	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	89.8	90.0	90.0	90.0	90.0	90.1	90.0	90.0	90.1	90.0	90.1	90.2	90.1	90.2	90.2	90.2	90.2	90.2	90.2	90.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.2	90.2	90.2	90.2	90.2	90.3	90.3	90.3	90.2	90.3	90.3	90.3	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	90.2	90.2	90.2	90.2	90.1	90.1	90.1	90.1	90.0	90.0	90.0	89.9	89.9	89.8	89.8	89.7	89.7	89.6	89.6	89.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	89.5	89.5	89.4	89.4	89.3	89.3	89.3	89.2	89.2	89.2	89.1	89.1	89.0	89.0	88.9	88.9	88.8	88.8	88.7	88.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	88.6	88.3	88.0	87.4	86.6	86.1	85.9	85.6	85.1	84.4	83.7	83.0	82.0	80.5	77.5	62.9	50.5	48.0	47.4	46.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	44.3	41.1	37.4	33.6	29.9	26.7	23.8	21.4	19.3	17.8	16.6	16.0	15.8	15.8	16.0	16.4	16.9	17.6	18.4	19.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	19.2	18.8	17.6	15.8	13.8	11.9	10.1	8.3	6.4	4.5	2.8	1.4	0.5	0.3	0.1	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L38

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	20.8	48.7	66.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	76.2	81.1	83.7	85.2	86.0	86.6	86.9	87.2	87.4	87.6	87.7	87.8	87.9	88.0	88.1	88.2	88.2	88.3	88.4	88.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.4	88.5	88.5	88.5	88.6	88.6	88.6	88.7	88.8	88.8	88.9	88.9	88.9	89.0	89.0	89.0	89.0	89.0	89.0	89.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.0	88.9	89.0	89.0	89.0	89.0	89.0	89.1	89.1	89.1	89.3	89.3	89.3	89.3	89.5	89.5	89.5	89.5	89.6	89.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	89.6	89.6	89.6	89.7	89.7	89.7	89.8	89.7	89.7	89.6	89.8	89.8	89.9	89.8	89.9	89.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.576	1.565	1.560	1.557	1.555	1.553	1.552
P	0.905	0.907	0.909	0.910	0.910	0.910	0.911

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

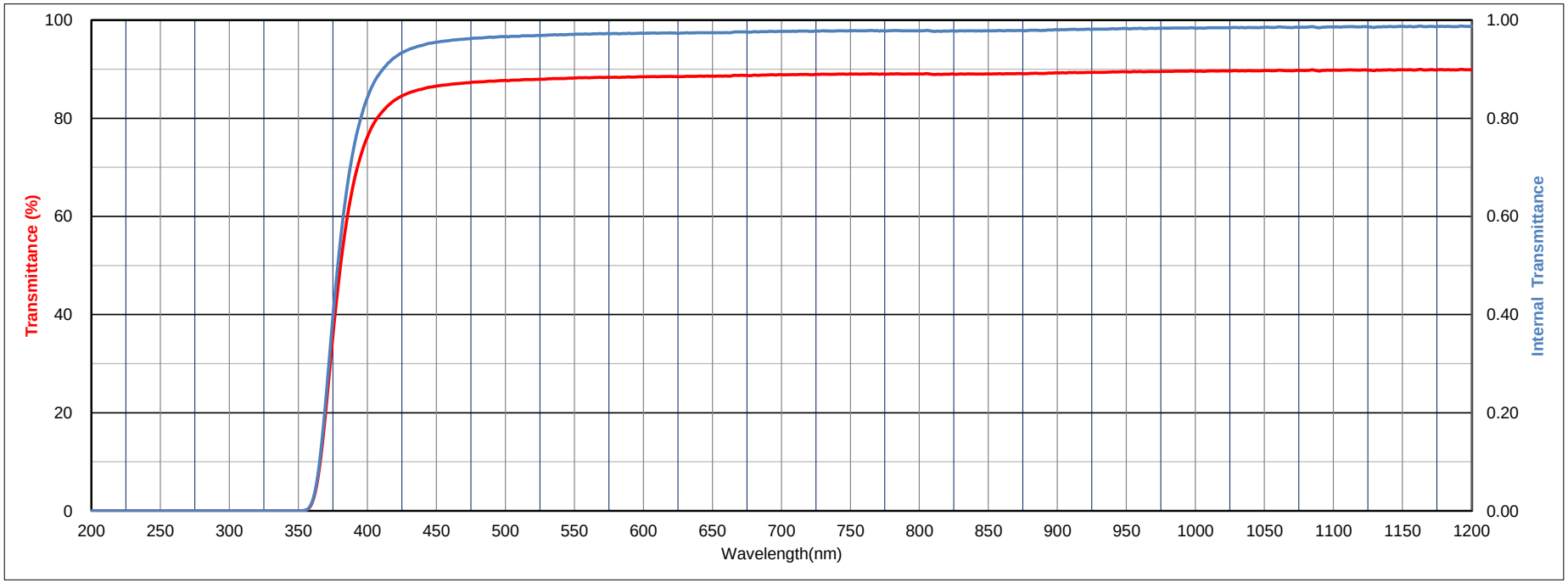
	x	y	Y	λ_d	P_e
A	0.449	0.408	88	583	2
C	0.312	0.319	88	573	1
D65	0.315	0.332	88	572	1

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	480	535	79	86	490	130	2.96

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
380±5	<35	>85



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HOYA

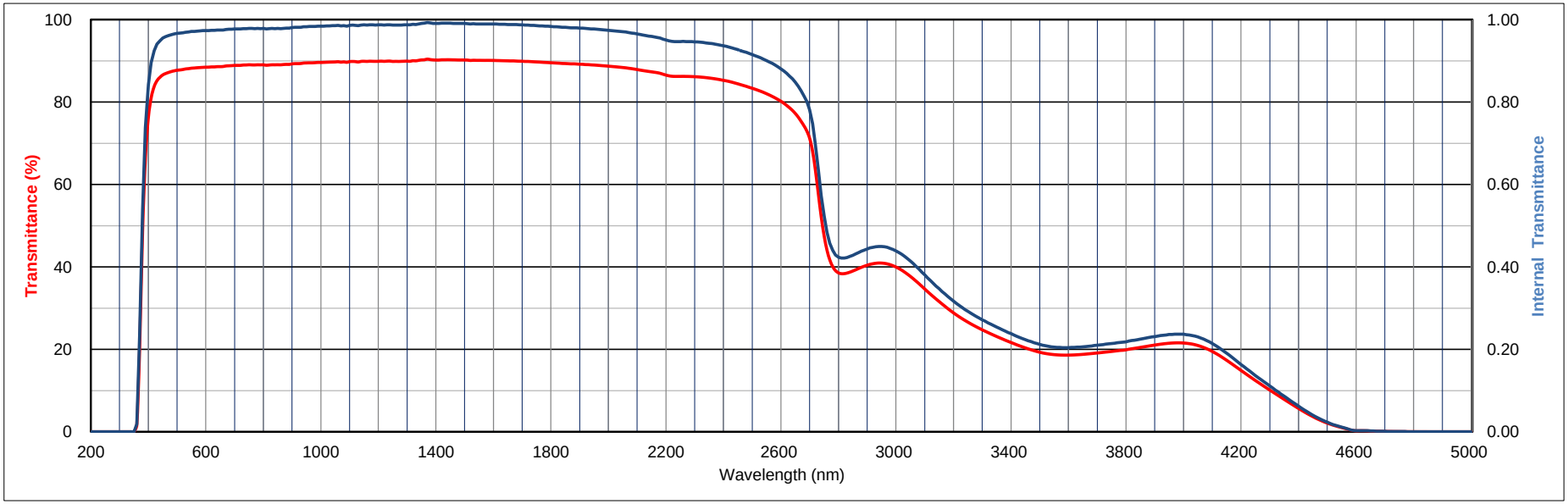
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L38

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	20.8	48.7	66.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	76.2	81.1	83.7	85.2	86.0	86.6	86.9	87.2	87.4	87.6	87.7	87.8	87.9	88.0	88.1	88.2	88.2	88.3	88.4	88.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.4	88.5	88.5	88.5	88.6	88.6	88.6	88.7	88.8	88.8	88.9	88.9	88.9	89.0	89.0	89.0	89.0	89.0	89.0	89.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.0	88.9	89.0	89.0	89.0	89.0	89.0	89.1	89.1	89.1	89.3	89.3	89.3	89.3	89.5	89.5	89.5	89.5	89.6	89.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	89.6	89.6	89.6	89.7	89.7	89.7	89.8	89.7	89.7	89.6	89.8	89.8	89.8	89.7	89.9	89.9	89.8	89.9	89.9	89.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	89.9	89.9	89.9	89.9	89.9	89.8	89.9	89.8	89.9	89.9	89.9	89.9	90.0	90.0	90.1	90.2	90.2	90.4	90.3	90.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.2	90.2	90.2	90.2	90.3	90.3	90.2	90.2	90.2	90.2	90.2	90.2	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	90.1	90.1	90.0	90.0	90.0	90.0	90.0	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.8	89.7	89.7	89.6	89.6	89.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	89.5	89.5	89.5	89.4	89.4	89.3	89.3	89.3	89.3	89.2	89.2	89.2	89.1	89.1	89.0	89.0	88.9	88.9	88.8	88.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	88.7	88.4	87.9	87.3	86.5	86.2	86.1	85.8	85.3	84.4	83.3	82.0	80.2	77.2	71.1	47.6	38.6	39.0	40.4	40.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	40.0	37.7	34.6	31.6	28.9	26.6	24.7	23.1	21.7	20.3	19.3	18.7	18.6	18.8	19.1	19.5	19.9	20.5	21.0	21.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	21.5	20.9	19.5	17.3	14.9	12.4	10.1	7.9	5.7	3.7	2.1	1.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L39

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.8	24.6	47.8
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	64.3	74.0	79.5	82.5	84.3	85.3	86.0	86.4	86.7	86.9	87.1	87.3	87.4	87.6	87.7	87.7	87.9	88.0	88.0	88.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.1	88.2	88.2	88.2	88.3	88.3	88.3	88.4	88.4	88.4	88.5	88.5	88.5	88.6	88.6	88.6	88.6	88.7	88.7	88.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	88.6	88.6	88.6	88.6	88.6	88.7	88.7	88.7	88.8	88.8	88.8	88.9	89.0	89.0	89.2	89.2	89.1	89.2	89.2	89.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	89.3	89.3	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.5	89.5	89.6	89.6	89.6	89.6				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.615	1.597	1.588	1.583	1.580	1.578	1.577
P	0.895	0.900	0.902	0.903	0.904	0.904	0.905

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

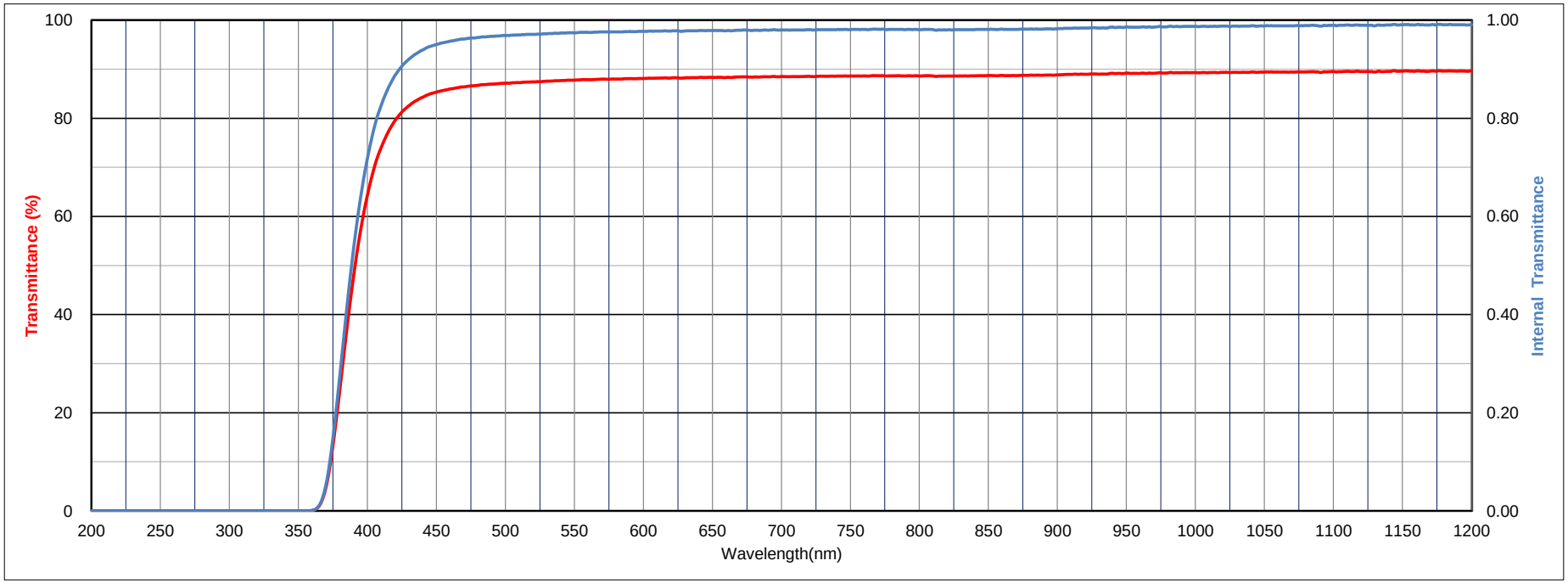
	x	y	Y	λ_d	P_e
A	0.450	0.409	88	582	3
C	0.313	0.321	88	572	2
D65	0.316	0.333	88	571	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	440	490	90	100	460	170	3.29

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
390±5	<40	>85



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HOYA

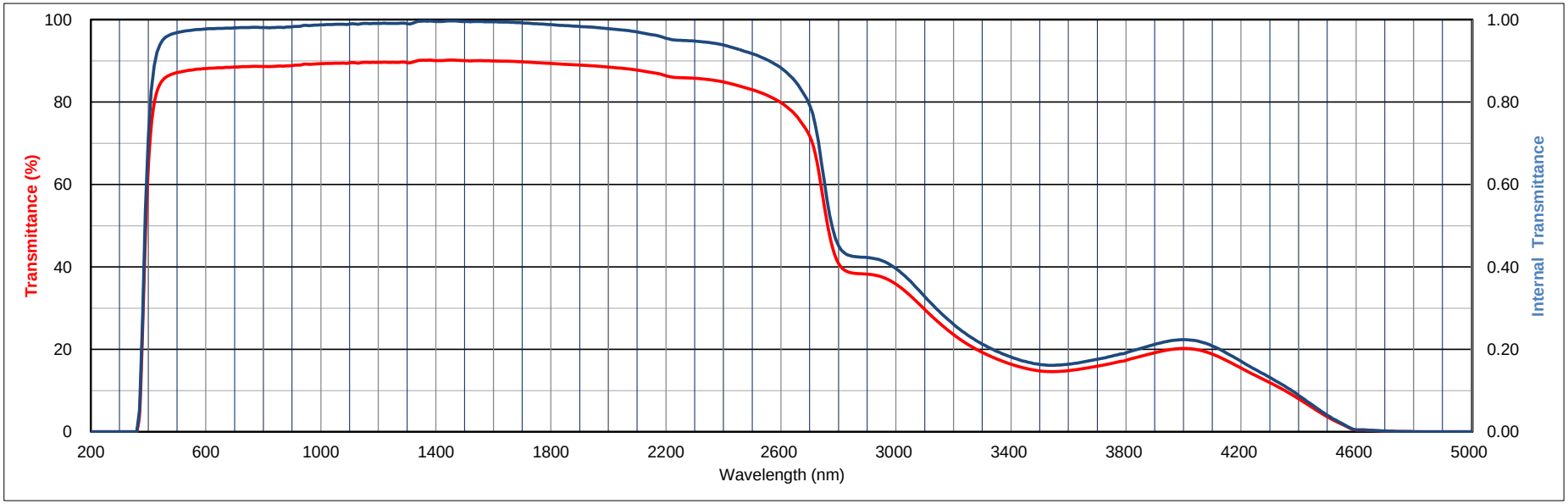
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L39

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.8	24.6	47.8
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	64.3	74.0	79.5	82.5	84.3	85.3	86.0	86.4	86.7	86.9	87.1	87.3	87.4	87.6	87.7	87.7	87.9	88.0	88.0	88.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	88.1	88.2	88.2	88.2	88.3	88.3	88.3	88.4	88.4	88.4	88.5	88.5	88.5	88.6	88.6	88.6	88.6	88.7	88.7	88.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	88.6	88.6	88.6	88.6	88.6	88.7	88.7	88.7	88.8	88.8	88.8	88.9	89.0	89.0	89.2	89.2	89.1	89.2	89.2	89.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	89.3	89.3	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.4	89.5	89.6	89.5	89.4	89.6	89.6	89.6	89.6	89.6	89.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	89.6	89.6	89.7	89.6	89.6	89.6	89.6	89.6	89.7	89.7	89.5	89.5	89.7	89.9	90.1	90.1	90.1	90.1	90.2	90.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.0	90.0	90.0	90.1	90.1	90.2	90.2	90.1	90.1	90.1	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	90.0	90.0	89.9	89.9	89.9	89.9	89.9	89.9	89.8	89.8	89.8	89.7	89.7	89.6	89.6	89.5	89.5	89.5	89.4	89.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	89.4	89.3	89.3	89.2	89.2	89.1	89.1	89.1	89.0	89.0	89.0	88.9	88.9	88.8	88.8	88.8	88.7	88.7	88.6	88.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	88.5	88.2	87.7	87.2	86.4	85.9	85.8	85.4	84.9	84.0	83.0	81.7	79.9	76.9	71.7	55.1	40.9	38.5	38.2	37.6
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	35.8	33.0	29.7	26.4	23.6	21.2	19.3	17.7	16.4	15.4	14.8	14.6	14.8	15.3	15.9	16.6	17.3	18.3	19.2	19.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	20.2	19.9	18.8	17.3	15.5	13.7	11.9	10.1	8.0	5.8	3.6	1.9	0.4	0.3	0.2	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L42

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	5.8	49.8	75.3	82.9	85.6	86.9	87.6	88.1	88.5	88.7	89.0	89.1	89.3	89.4	89.5	89.6	89.7	89.7	89.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	89.8	89.8	89.8	89.8	89.8	89.7	89.8	89.9	89.9	90.0	90.0	90.0	90.0	90.1	90.1	90.1	90.1	90.1	90.1	90.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.0	89.9	89.9	89.9	90.0	90.0	90.0	90.0	90.0	90.0	90.1	90.1	90.1	90.2	90.3	90.3	90.3	90.3	90.3	90.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.4	90.3	90.4	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.5	90.6	90.6	90.6				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.547	1.537	1.533	1.531	1.529	1.528	1.528
P	0.912	0.914	0.915	0.916	0.916	0.916	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

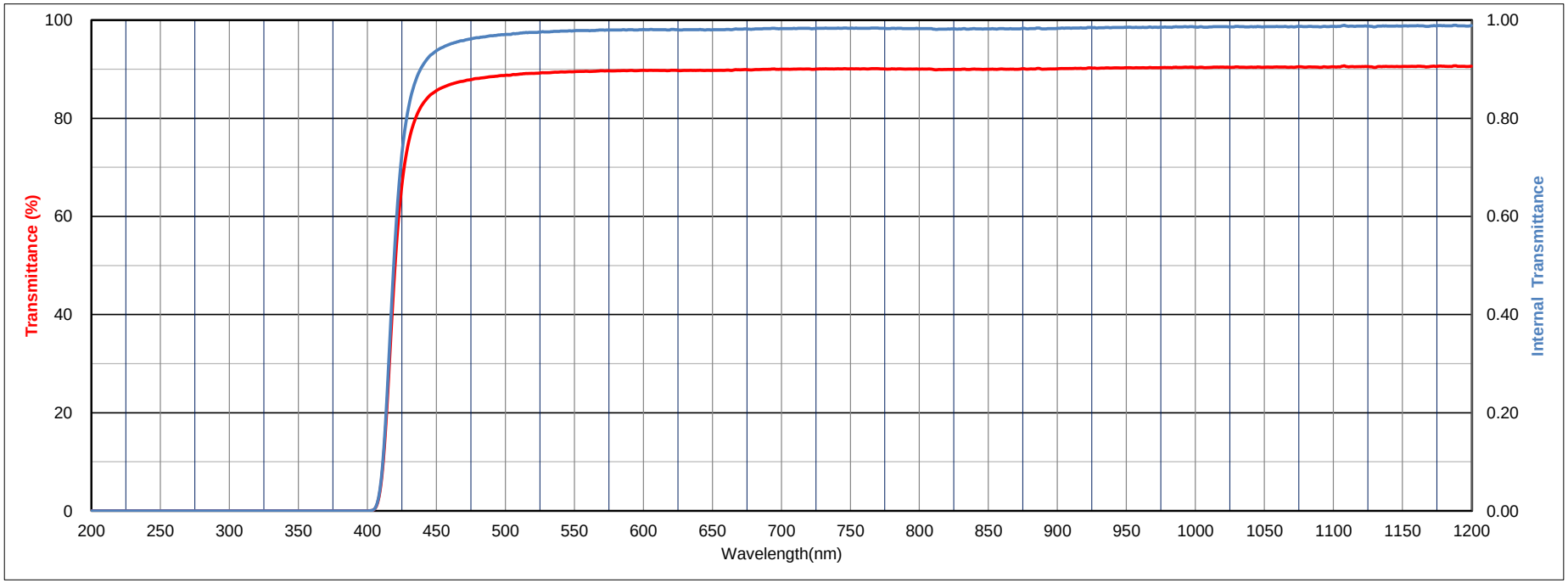
	x	y	Y	λ_d	P_e
A	0.452	0.412	90	580	6
C	0.317	0.329	89	569	5
D65	0.319	0.342	89	569	5

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	550	600	92	105	540	130	2.59

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
420±5	<25	>85



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HOYA

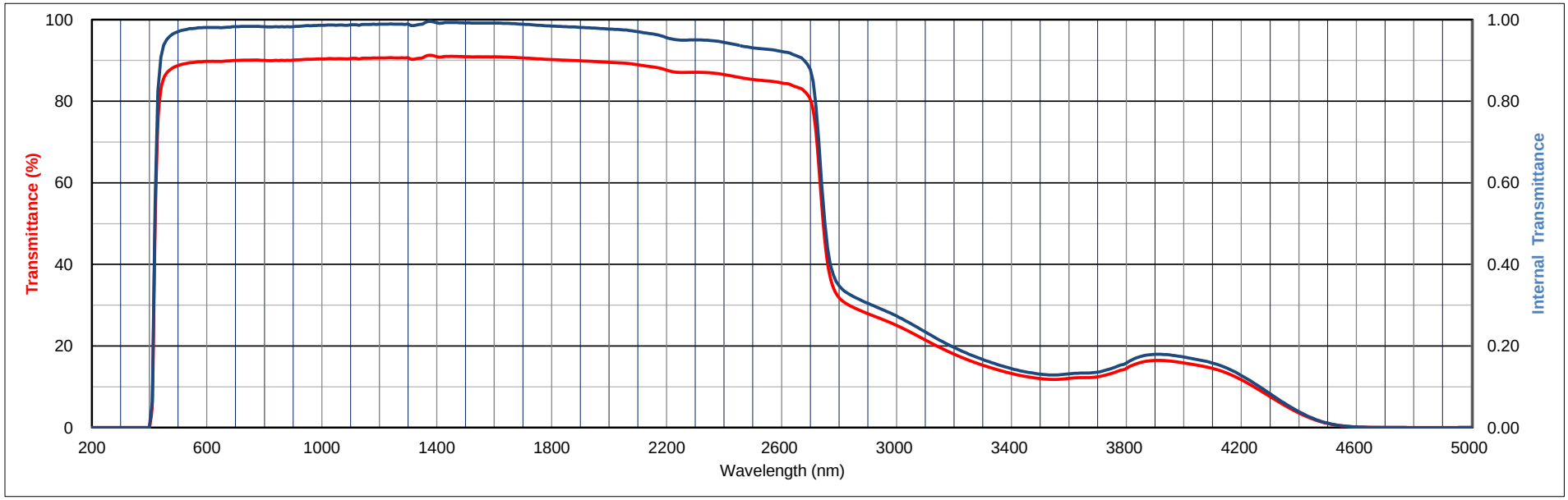
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

L42

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	5.8	49.8	75.3	82.9	85.6	86.9	87.6	88.1	88.5	88.7	89.0	89.1	89.3	89.4	89.5	89.6	89.7	89.7	89.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	89.8	89.8	89.8	89.8	89.8	89.7	89.8	89.9	89.9	90.0	90.0	90.0	90.0	90.1	90.1	90.1	90.1	90.1	90.1	90.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.0	89.9	89.9	89.9	90.0	90.0	90.0	90.0	90.0	90.0	90.1	90.1	90.1	90.2	90.3	90.3	90.3	90.3	90.3	90.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.4	90.3	90.4	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.5	90.4	90.5	90.6	90.6	90.5	90.6	90.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.6	90.6	90.6	90.6	90.7	90.6	90.6	90.6	90.6	90.6	90.7	90.3	90.3	90.4	90.5	90.6	91.0	91.2	91.2	91.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.9	90.8	90.9	91.0	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	90.9	90.9	90.9	90.8	90.8	90.8	90.8	90.7	90.7	90.6	90.6	90.6	90.6	90.5	90.5	90.4	90.4	90.3	90.3	90.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.2	90.2	90.1	90.1	90.1	90.1	90.0	90.0	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.7	89.7	89.6	89.6	89.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	89.5	89.3	88.9	88.4	87.6	87.0	87.1	87.0	86.5	85.9	85.3	85.0	84.5	83.5	80.4	46.2	31.9	29.5	27.9	26.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	25.1	23.3	21.5	19.7	18.0	16.5	15.3	14.2	13.3	12.5	12.0	11.8	12.1	12.2	12.4	13.3	14.5	16.0	16.5	16.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.8	15.2	14.5	13.3	11.7	9.7	7.6	5.5	3.6	2.1	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y44

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.2	6.9	49.1	76.0	83.7	86.2	87.5	88.4	89.0	89.5	89.9	90.2	90.5	90.7	90.8	90.9	90.9	91.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	91.0	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.1	91.0	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.7	90.6	90.6	90.6	90.6	90.6	90.6	90.5	90.5	90.6	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.7	90.7	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.8	90.7	90.8	90.7	90.7	90.8	90.7	90.7	90.8	90.9	90.8	90.9	90.8	90.8	90.8	90.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.546	1.536	1.531	1.528	1.526	1.525	1.524
P	0.912	0.914	0.916	0.916	0.917	0.917	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

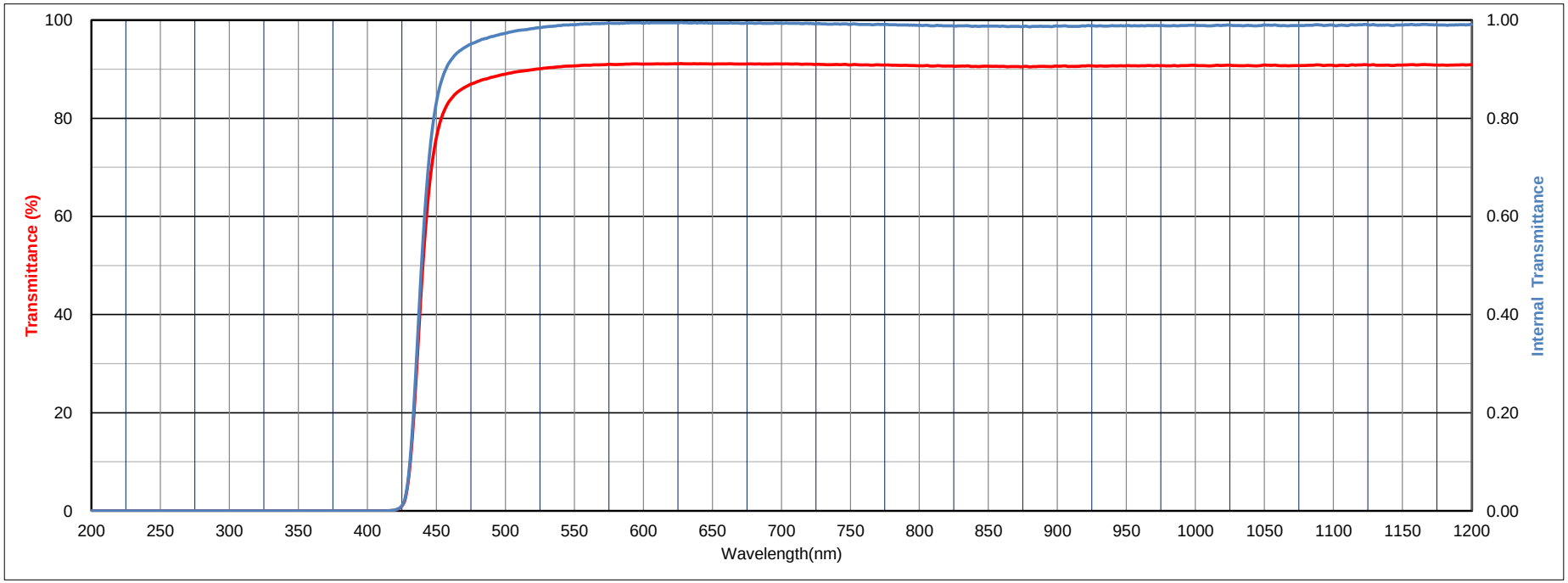
	x	y	Y	λ_d	P_e
A	0.461	0.424	91	580	21
C	0.335	0.366	90	569	20
D65	0.336	0.376	90	568	20

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	570	600	99	107	540	130	2.59

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
440±5	<25	>85



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HOYA

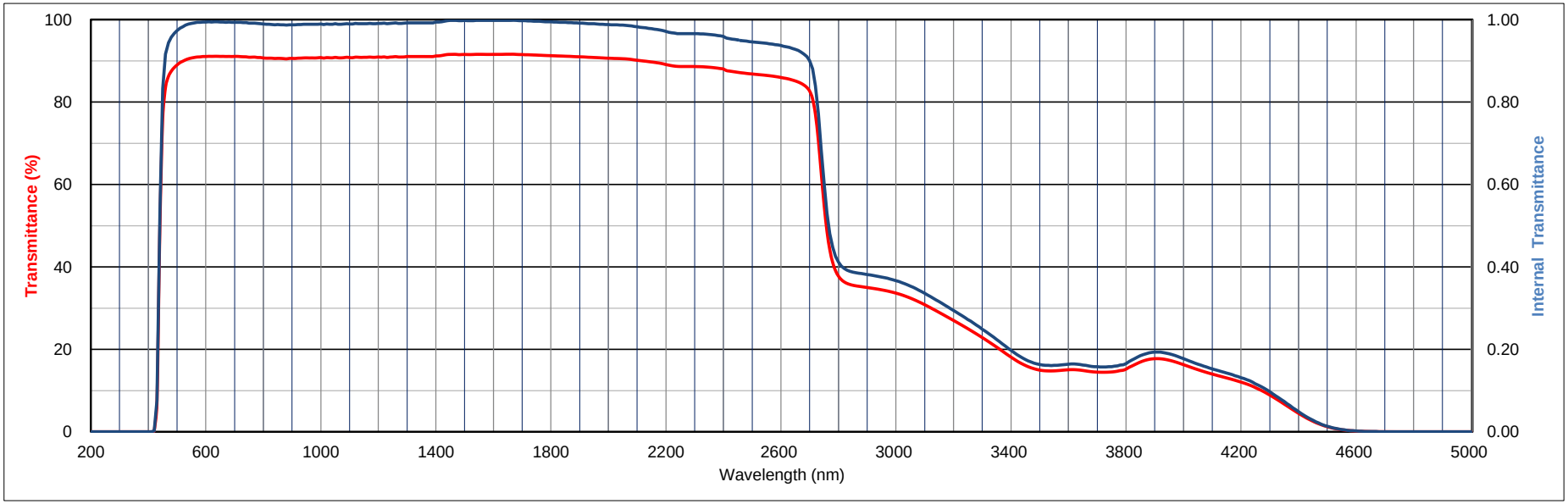
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y44

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.2	6.9	49.1	76.0	83.7	86.2	87.5	88.4	89.0	89.5	89.9	90.2	90.5	90.7	90.8	90.9	90.9	91.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	91.0	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.1	91.0	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.7	90.6	90.6	90.6	90.6	90.6	90.6	90.5	90.5	90.6	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.7	90.7	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.8	90.7	90.8	90.7	90.7	90.8	90.7	90.7	90.8	90.9	90.8	90.7	90.9	90.9	90.8	90.8	90.8	90.9	90.8	90.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.9	90.9	90.9	90.8	90.9	90.9	91.0	90.9	90.9	90.9	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	91.2	91.2	91.3	91.4	91.5	91.5	91.6	91.6	91.5	91.5	91.5	91.5	91.5	91.5	91.6	91.6	91.6	91.6	91.5	91.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.6	91.5	91.5	91.5	91.5	91.4	91.4	91.4	91.4	91.3	91.3	91.3
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	91.2	91.2	91.2	91.2	91.1	91.1	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8	90.8	90.7	90.7	90.7
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.6	90.5	90.1	89.7	89.1	88.6	88.6	88.4	88.0	87.2	86.8	86.5	86.0	85.1	82.6	55.1	37.8	35.5	35.0	34.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	33.6	32.4	30.8	29.0	27.0	25.0	22.9	20.5	18.1	16.1	15.0	14.8	15.0	14.9	14.5	14.5	15.2	16.9	17.7	17.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	16.3	15.1	14.0	13.1	12.0	10.7	8.9	6.7	4.5	2.6	1.2	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y48

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	43.9	79.6	87.1	88.9	89.4	89.7	89.8	89.9	90.0	90.0	90.1	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.2	90.2	90.3	90.4	90.3	90.3	90.4	90.4	90.4	90.4	90.3	90.4	90.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.3	90.2	90.2	90.2	90.3	90.3	90.3	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.7	90.8	90.7	90.7	90.7	90.8	90.8	90.7	90.7	90.8	90.8	90.8	90.9	90.9	90.9	90.9				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.538	1.534	1.532	1.531	1.530	1.529	1.529
P	0.914	0.915	0.915	0.916	0.916	0.916	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

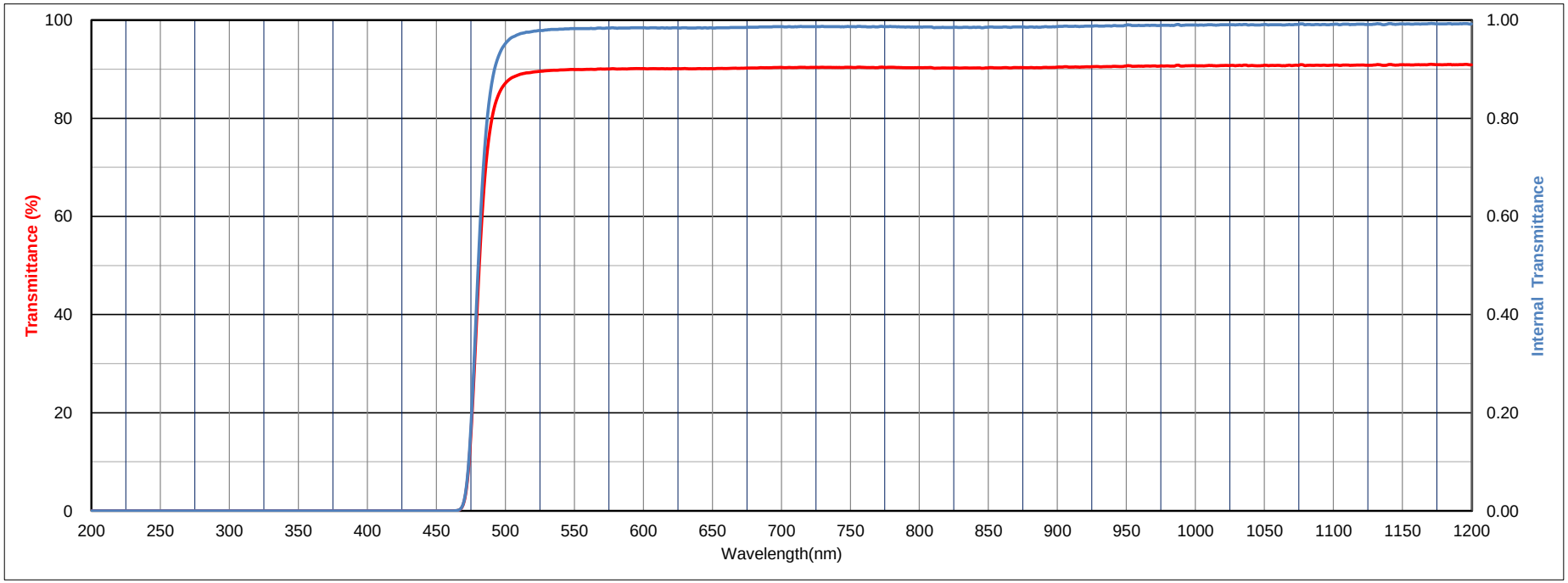
	x	y	Y	λ_d	P_e
A	0.497	0.467	89	580	76
C	0.416	0.504	86	570	79
D65	0.412	0.510	87	569	79

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	560	625	94	105	540	130	2.67

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
480±5	<25	>85



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HOYA

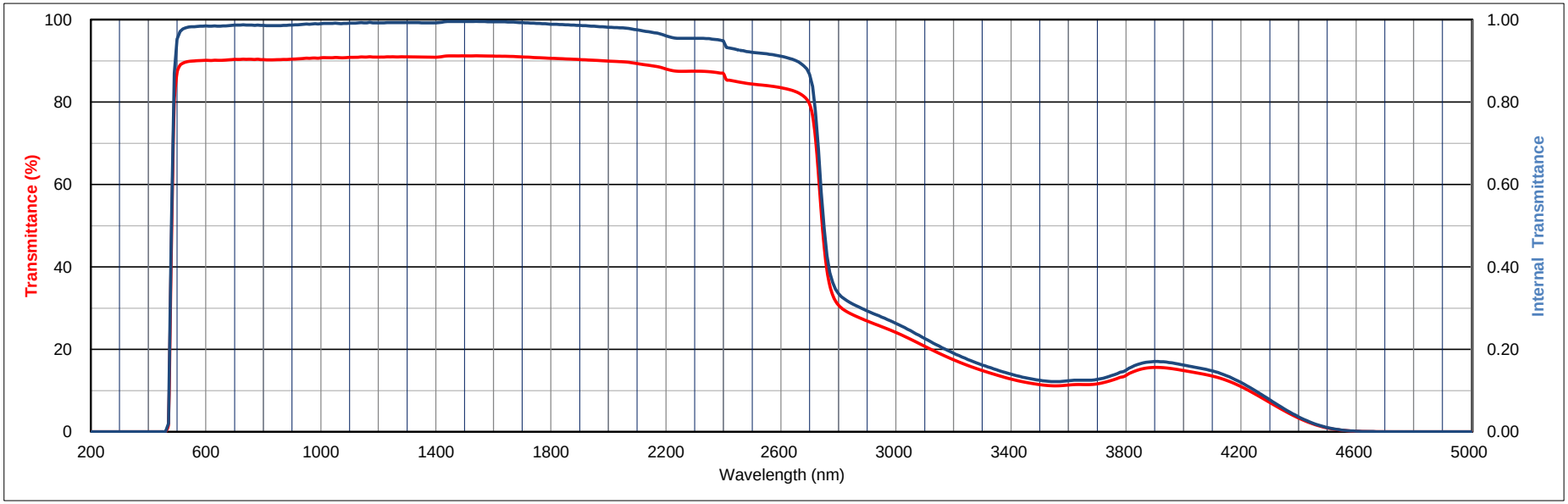
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y48

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	43.9	79.6	87.1	88.9	89.4	89.7	89.8	89.9	90.0	90.0	90.1	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.2	90.2	90.3	90.4	90.3	90.3	90.4	90.4	90.4	90.4	90.3	90.4	90.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.3	90.2	90.2	90.2	90.3	90.3	90.3	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.7	90.8	90.7	90.7	90.7	90.8	90.8	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	91.0	90.9	90.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.9	90.9	90.9	91.0	91.0	91.0	90.9	90.9	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.9	90.9	91.0	91.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.0	90.9	90.9	90.9	90.9	90.8	90.8	90.7	90.7	90.7	90.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.6	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.4	90.3	90.3	90.3	90.2	90.2	90.2	90.1	90.1	90.1	90.0	90.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	89.9	89.8	89.3	88.8	88.0	87.4	87.5	87.4	86.9	84.9	84.4	84.0	83.5	82.5	79.4	45.1	30.7	28.4	26.9	25.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.1	22.5	20.7	19.0	17.5	16.1	14.9	13.8	12.8	12.0	11.4	11.1	11.3	11.5	11.6	12.5	13.7	15.2	15.6	15.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	14.9	14.2	13.5	12.5	11.0	9.1	7.1	5.1	3.3	1.9	0.9	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y50

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	8.4	42.5	71.2	83.0	87.2	88.9	89.6	89.8	90.0	90.1	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.1	90.1	90.2	90.2	90.2	90.2	90.2	90.3	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.4	90.5	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.4	90.4	90.3	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.8	90.9	90.9	90.9	90.9	91.0	91.0	91.0	91.0				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.552	1.537	1.530	1.526	1.523	1.522	1.520
P	0.911	0.914	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

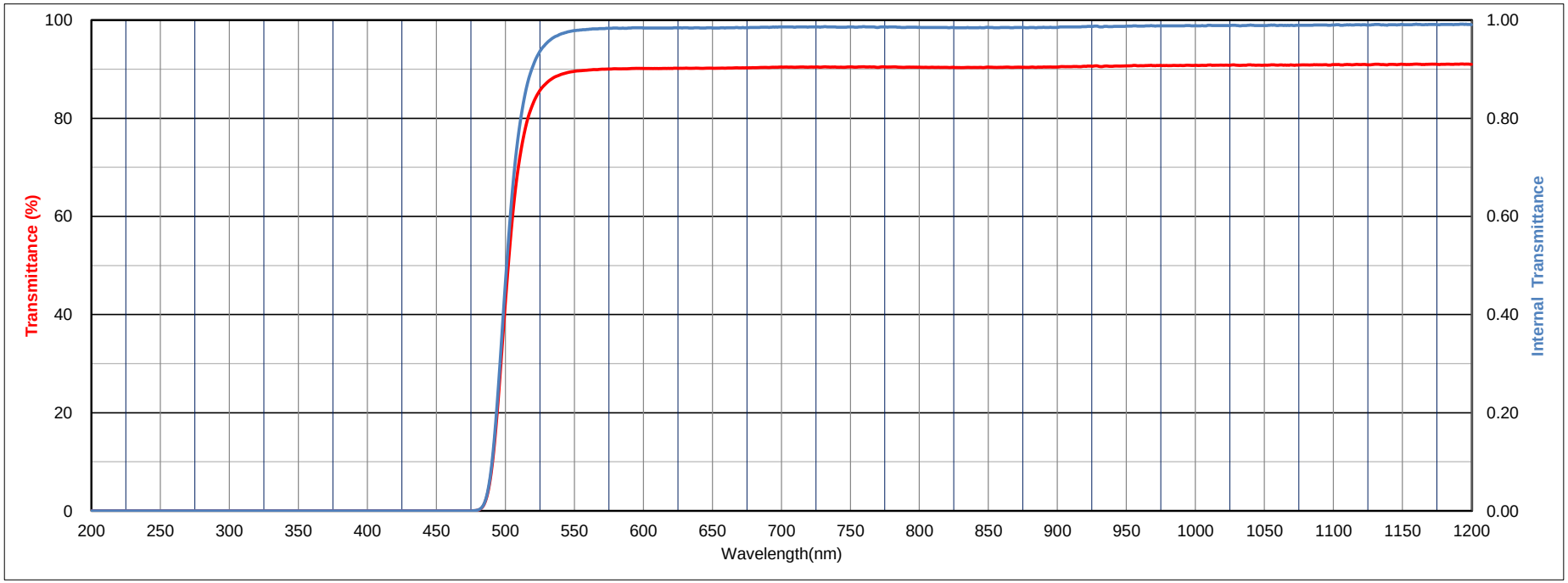
	x	y	Y	λ_d	P_e
A	0.515	0.471	86	582	91
C	0.453	0.521	81	573	93
D65	0.448	0.525	81	572	93

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	560	620	96	108	540	130	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
500±5	<25	>85



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HOYA

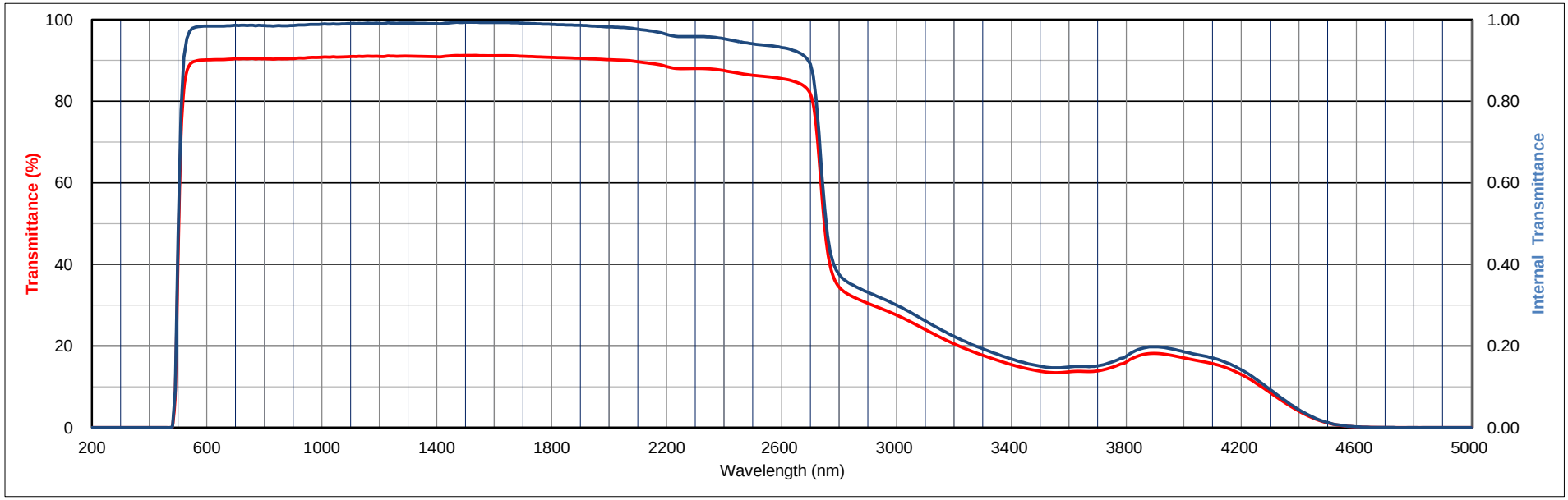
HOYA CORPORATION OPTICS SECTION

Transmittance (T) units: %

Thickness 2.50 mm

Y50

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	8.4	42.5	71.2	83.0	87.2	88.9	89.6	89.8	90.0	90.1	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.1	90.1	90.2	90.2	90.2	90.2	90.2	90.3	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.4	90.5	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.4	90.4	90.3	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.8	90.9	90.9	90.9	91.0	90.9	91.0	91.0	91.0	91.0	91.0	91.0	91.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.0	90.9	91.0	91.1	91.1	91.1	91.0	91.0	91.0	91.1	91.0	91.0	91.0	91.0	91.0	91.0	91.0	90.9	90.9	90.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.9	90.9	90.9	91.0	91.1	91.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.1	91.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.2	91.2	91.2	91.2	91.2	91.2	91.1	91.1	91.1	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.8	90.8	90.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.7	90.7	90.7	90.7	90.7	90.6	90.6	90.6	90.5	90.5	90.5	90.5	90.5	90.4	90.4	90.4	90.3	90.3	90.2	90.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.2	90.0	89.7	89.2	88.5	88.0	88.0	87.9	87.5	86.9	86.4	86.0	85.5	84.7	81.8	49.1	34.5	32.0	30.5	29.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	27.6	25.9	24.0	22.2	20.5	19.0	17.7	16.5	15.4	14.5	13.8	13.4	13.7	13.8	13.9	14.8	16.1	17.8	18.2	17.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	17.1	16.4	15.7	14.6	13.0	10.9	8.6	6.2	4.0	2.3	1.1	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

Y52

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	47.3	79.0	87.1	89.2	89.8	90.1	90.2	90.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.3	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.4	90.4	90.5	90.5	90.5	90.5	90.5	90.6	90.5	90.5	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.5	90.5	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.9	90.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.9	91.0	90.9	90.9	90.9	91.0	91.0	91.0	90.9	91.0	91.0	91.0	91.0	91.1	91.1	91.1				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.552	1.539	1.531	1.527	1.524	1.522	1.521
P	0.911	0.914	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

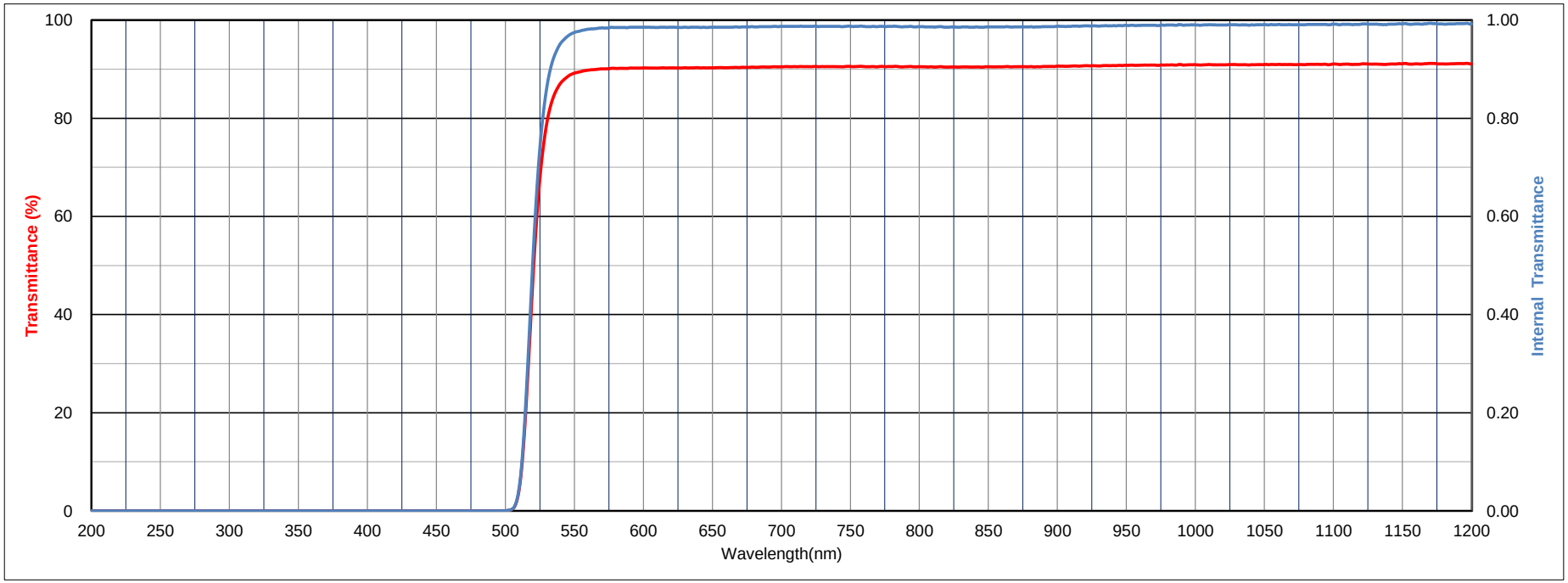
	x	y	Y	λ_d	P_e
A	0.535	0.460	81	584	97
C	0.486	0.507	73	577	98
D65	0.482	0.510	73	576	98

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	560	620	96	108	540	130	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
520±5	<25	>85



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HOYA

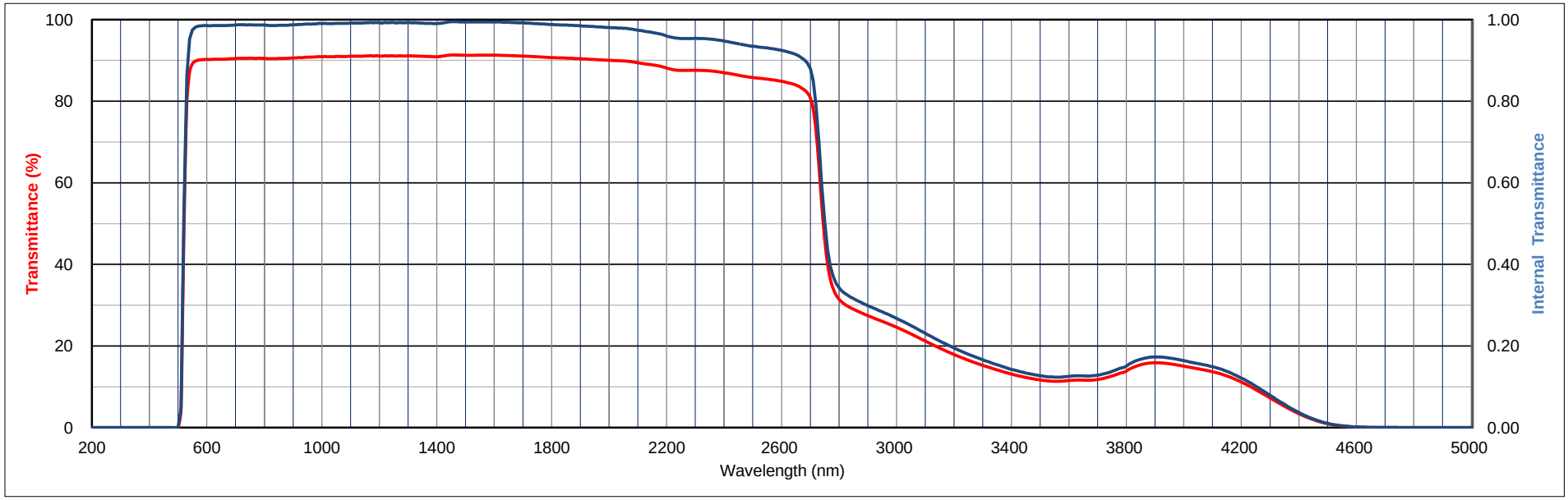
HOYA CORPORATION OPTICS SECTION

Transmittance (T) units: %

Thickness 2.50 mm

Y52

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	47.3	79.0	87.1	89.2	89.8	90.1	90.2	90.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.3	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.4	90.4	90.5	90.5	90.5	90.5	90.5	90.6	90.5	90.5	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.5	90.5	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.9	90.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.9	91.0	90.9	90.9	90.9	91.0	91.0	91.0	90.9	91.0	91.0	91.0	91.0	91.0	91.0	91.1	91.1	91.2	91.1	91.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.1	91.0	91.2	91.1	91.1	91.1	91.0	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.0	91.0	91.0	90.9	90.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.9	90.9	91.0	91.2	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.2	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.3	91.3	91.3	91.2	91.2	91.2	91.2	91.1	91.1	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.8	90.8	90.8	90.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.7	90.7	90.6	90.6	90.6	90.6	90.5	90.5	90.5	90.5	90.4	90.4	90.4	90.3	90.3	90.2	90.2	90.1	90.1	90.1
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.0	89.9	89.4	88.9	88.1	87.6	87.6	87.4	87.0	86.4	85.8	85.4	84.9	84.0	80.8	46.2	31.5	29.0	27.4	26.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.6	23.0	21.2	19.5	17.9	16.5	15.3	14.1	13.1	12.3	11.7	11.3	11.5	11.6	11.8	12.6	13.9	15.4	15.9	15.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.0	14.4	13.7	12.6	11.2	9.3	7.3	5.2	3.4	2.0	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O54

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	8.3	42.1	71.4	83.6	87.8	89.3	90.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.2	90.3	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.5	90.6	90.5	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.6	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.6	90.7	90.6	90.7	90.8	90.8	90.8	90.8	90.9	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.9	90.9	90.9	90.9	91.0	90.9	91.0	90.9	91.0	90.9	91.0	91.0	91.1	91.1	91.1	91.1				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.552	1.541	1.532	1.528	1.525	1.524	1.522
P	0.911	0.913	0.915	0.916	0.917	0.917	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

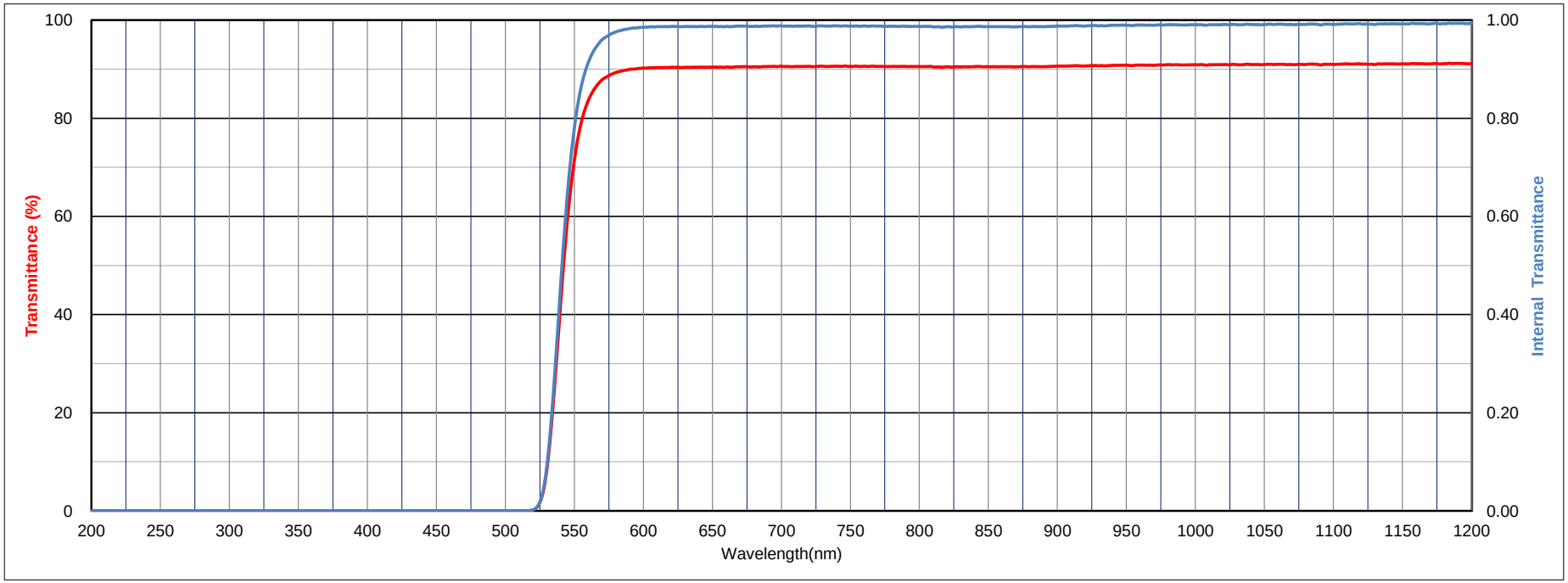
	x	y	Y	λ_d	P_e
A	0.570	0.428	68	589	99
C	0.534	0.464	57	584	100
D65	0.534	0.464	56	583	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	99	107	520	140	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
540±5	<25	>85



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

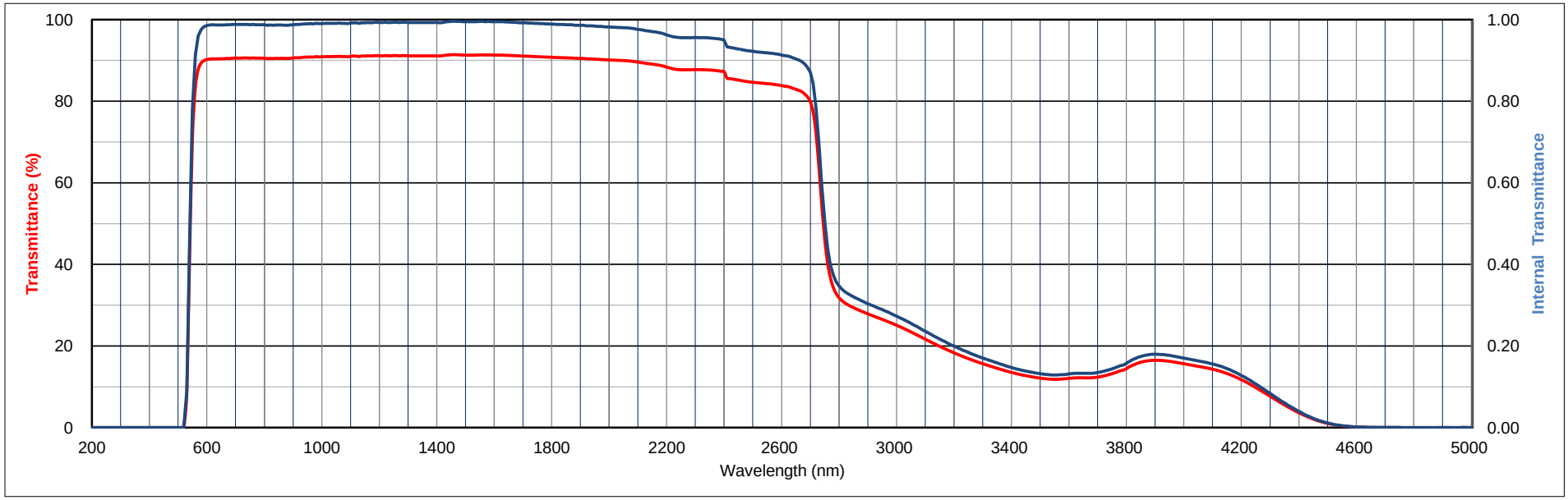
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O54

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	8.3	42.1	71.4	83.6	87.8	89.3	90.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	90.2	90.3	90.4	90.4	90.4	90.4	90.4	90.5	90.5	90.5	90.6	90.5	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.6	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.5	90.6	90.7	90.6	90.7	90.8	90.8	90.8	90.8	90.9	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.9	90.9	90.9	90.9	91.0	90.9	91.0	90.9	91.0	90.9	91.0	91.1	91.0	91.0	91.1	91.1	91.1	91.1	91.1	91.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.1	91.1	91.2	91.1	91.1	91.2	91.2	91.1	91.2	91.2	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	91.1	91.1	91.2	91.3	91.3	91.4	91.4	91.4	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.3	91.4	91.3	91.3	91.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.3	91.3	91.3	91.3	91.3	91.2	91.2	91.2	91.1	91.1	91.1	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.8	90.7	90.7	90.7	90.7	90.6	90.6	90.6	90.5	90.5	90.5	90.5	90.4	90.4	90.4	90.3	90.3	90.2	90.2	90.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.1	90.0	89.6	89.1	88.4	87.7	87.7	87.6	87.2	85.2	84.6	84.3	83.8	82.9	79.9	46.4	31.8	29.4	27.9	26.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	25.1	23.4	21.7	19.9	18.3	16.9	15.6	14.5	13.5	12.7	12.1	11.8	12.1	12.2	12.4	13.2	14.4	16.0	16.5	16.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.6	15.0	14.3	13.3	11.7	9.8	7.7	5.6	3.6	2.1	1.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O56

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	9.6	41.3	69.9	82.8	87.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	89.2	89.9	90.2	90.3	90.4	90.5	90.4	90.5	90.4	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.5	90.5	90.4	90.4	90.4	90.5	90.4	90.4	90.4	90.4	90.5	90.6	90.6	90.6	90.7	90.8	90.8	90.7	90.7	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	90.9	90.9	90.9	91.0	91.0	91.1	91.0	91.1				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.549	1.538	1.530	1.525	1.523	1.521	1.520
P	0.911	0.914	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

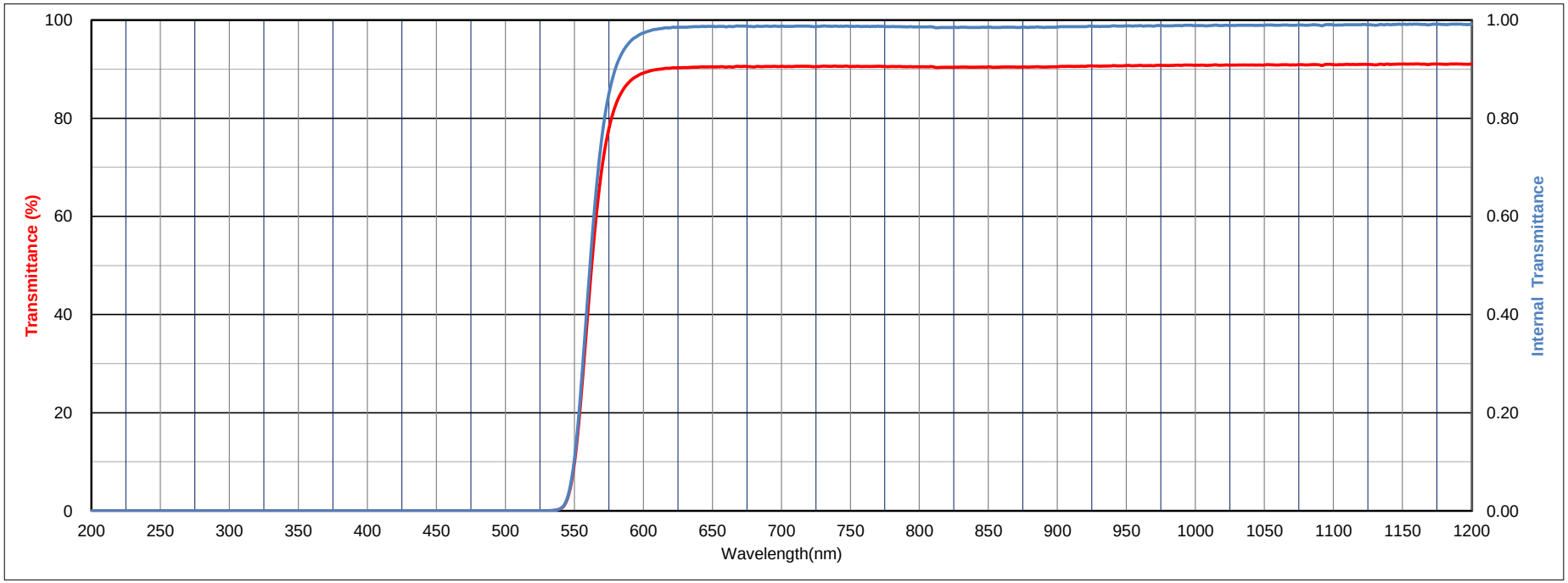
	x	y	Y	λ_d	P_e
A	0.610	0.389	52	597	100
C	0.588	0.412	40	592	100
D65	0.588	0.411	39	592	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	93	104	520	140	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
560±5	<25	>85



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The content of this catalog is accurate as of October ,2020

HOYA

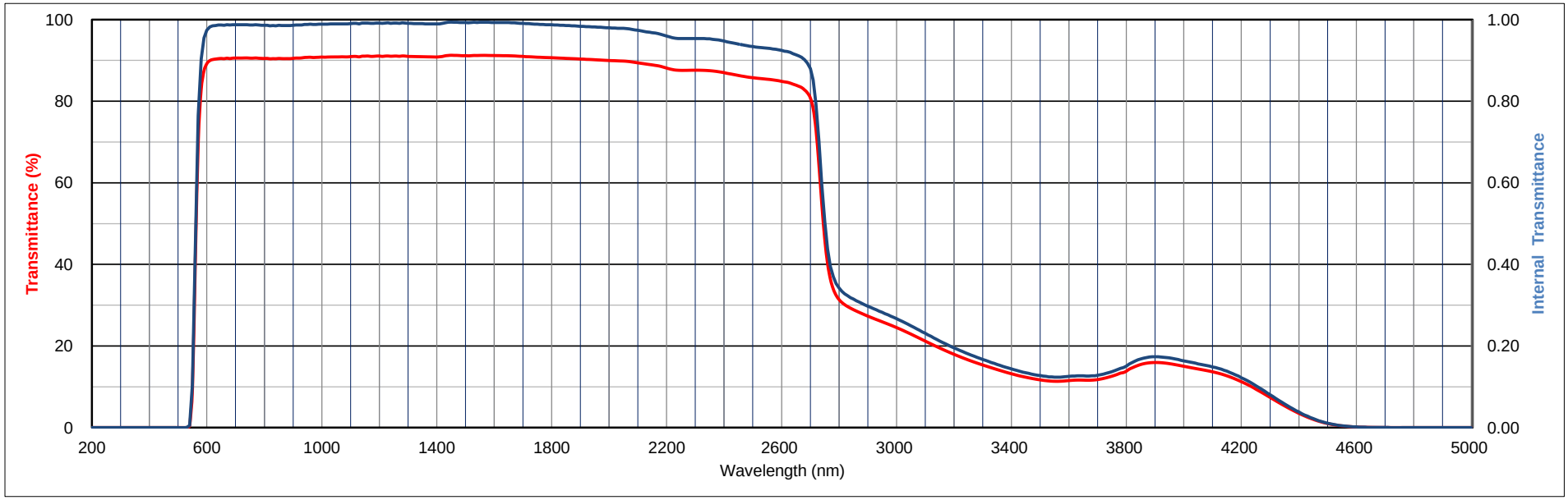
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O56

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	9.6	41.3	69.9	82.8	87.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	89.2	89.9	90.2	90.3	90.4	90.5	90.4	90.5	90.4	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.5	90.5	90.4	90.4	90.4	90.5	90.4	90.4	90.4	90.4	90.5	90.6	90.6	90.6	90.7	90.8	90.8	90.7	90.7	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	90.9	90.9	90.9	91.0	91.0	90.9	91.0	91.0	91.1	91.0	91.0	91.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.1	91.0	91.1	91.1	91.0	91.1	91.1	91.0	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.9	90.9	90.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.8	90.9	91.0	91.1	91.2	91.3	91.2	91.2	91.2	91.1	91.2	91.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.2	91.2	91.2	91.2	91.2	91.1	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8	90.8	90.7	90.7	90.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.7	90.6	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.4	90.3	90.3	90.3	90.2	90.2	90.2	90.1	90.1	90.0	90.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.0	89.8	89.4	88.9	88.1	87.6	87.6	87.5	87.0	86.3	85.8	85.4	84.9	83.9	80.8	46.4	31.4	28.9	27.3	25.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.5	22.9	21.2	19.5	18.0	16.6	15.3	14.2	13.2	12.3	11.7	11.3	11.5	11.6	11.8	12.6	13.8	15.5	16.0	15.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.0	14.4	13.7	12.7	11.2	9.4	7.4	5.3	3.5	2.0	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O58

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	7.4	38.9	69.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	83.0	87.7	89.4	90.0	90.3	90.4	90.4	90.5	90.5	90.6	90.6	90.6	90.6	90.6	90.5	90.6	90.5	90.6	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.6	90.5	90.6	90.7	90.8	90.6	90.7	90.8	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.7	90.7	90.8	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.9	90.9	90.9	90.9	90.9	91.0				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.550	1.540	1.531	1.526	1.524	1.522	1.520
P	0.911	0.913	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

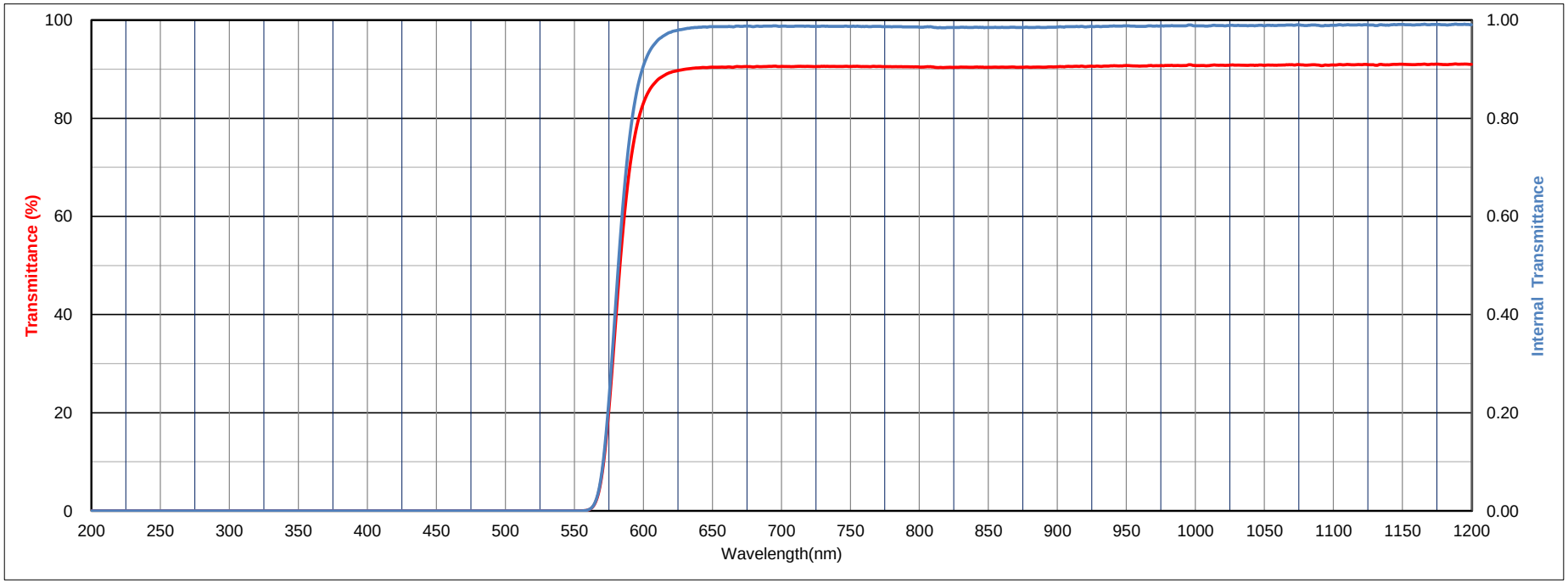
	x	y	Y	λ_d	P_e
A	0.654	0.346	36	606	100
C	0.643	0.356	24	604	100
D65	0.643	0.357	24	604	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	93	104	520	140	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
580±5	<25	>85



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HOYA

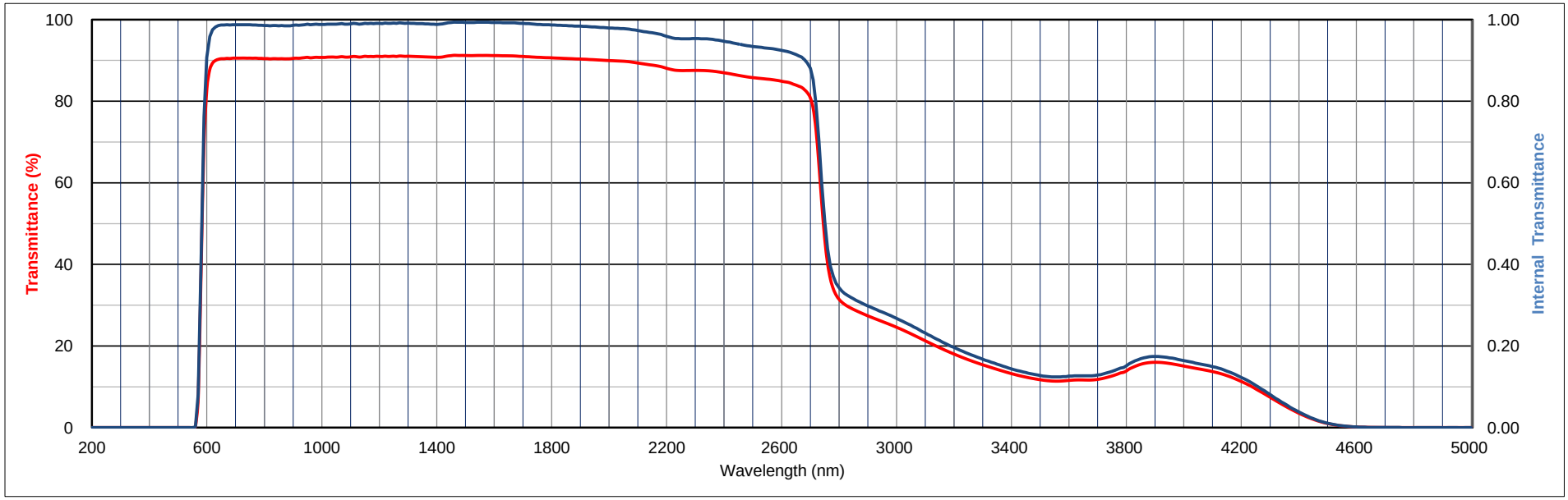
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

O58

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	7.4	38.9	69.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	83.0	87.7	89.4	90.0	90.3	90.4	90.4	90.5	90.5	90.6	90.6	90.6	90.6	90.6	90.5	90.6	90.5	90.6	90.5	90.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.6	90.5	90.6	90.7	90.8	90.6	90.7	90.8	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.7	90.7	90.8	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.9	91.0	90.9	90.8	90.9	91.0	90.9	91.0	90.9	91.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.1	91.0	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.8	90.8	90.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.8	90.8	90.8	91.0	91.1	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2	91.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.2	91.2	91.2	91.1	91.1	91.1	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.8	90.8	90.8	90.7	90.7	90.7	90.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.6	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.4	90.4	90.3	90.3	90.3	90.2	90.2	90.2	90.1	90.1	90.0	90.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.0	89.8	89.4	88.8	88.1	87.5	87.6	87.4	87.0	86.3	85.8	85.4	84.9	84.0	80.8	46.4	31.4	29.0	27.4	26.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.6	23.0	21.3	19.6	18.0	16.6	15.4	14.3	13.2	12.4	11.7	11.4	11.6	11.7	11.8	12.6	13.9	15.5	16.0	15.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.1	14.4	13.7	12.7	11.3	9.5	7.4	5.4	3.5	2.0	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R60

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	9.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	43.5	72.3	84.0	87.9	89.2	89.7	90.0	90.0	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.2	90.2	90.3	90.3	90.3	90.4	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.6	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.7	90.8	90.8	90.7	90.7	90.8	90.8	90.7	90.8	90.8	90.8	90.8	90.8	90.9	90.9	91.0				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.550	1.538	1.530	1.526	1.523	1.522	1.520
P	0.911	0.914	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

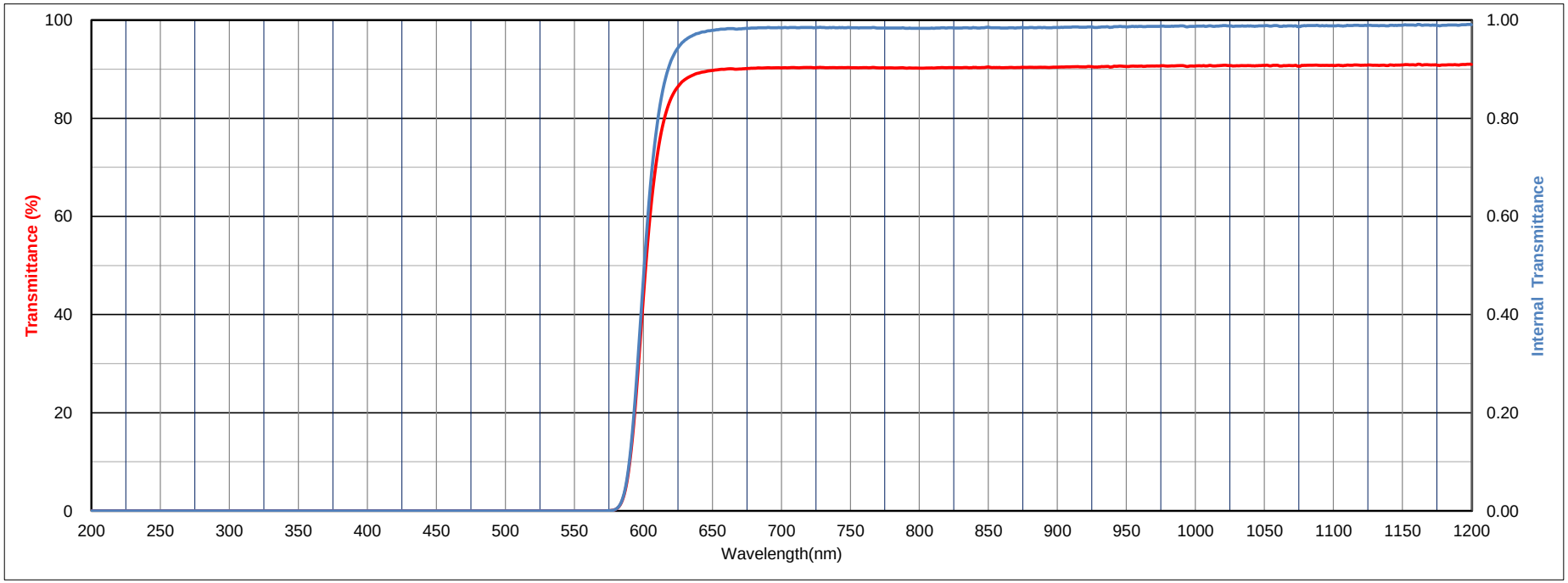
	x	y	Y	λ_d	P_e
A	0.687	0.312	22	618	100
C	0.683	0.316	14	616	100
D65	0.683	0.317	13	616	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	560	620	93	103	520	140	2.69

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
600±5	<25	>85



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HOYA

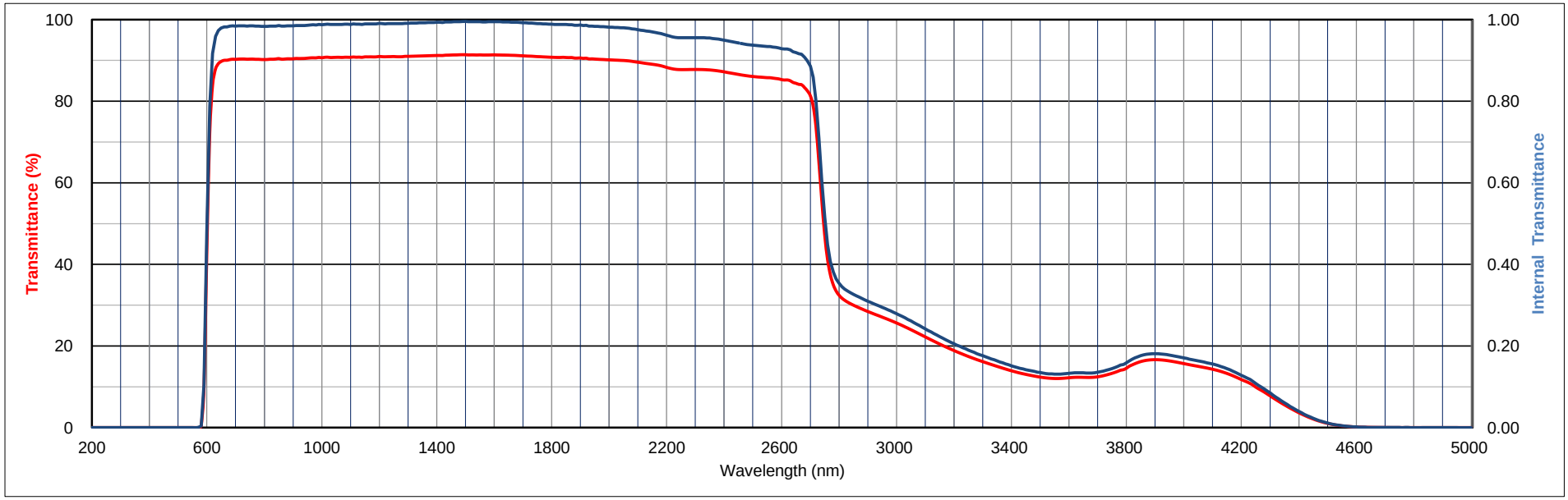
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R60

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	9.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	43.5	72.3	84.0	87.9	89.2	89.7	90.0	90.0	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.2	90.2	90.3	90.3	90.3	90.4	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.6	90.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.7	90.8	90.8	90.7	90.7	90.8	90.8	90.7	90.8	90.8	90.8	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	90.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.0	90.9	90.9	90.9	90.9	91.0	90.9	90.9	90.9	91.0	91.0	91.0	91.0	91.1	91.1	91.1	91.1	91.1	91.2	91.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	91.2	91.2	91.2	91.3	91.3	91.3	91.3	91.4	91.4	91.4	91.4	91.3	91.4	91.3	91.3	91.4	91.3	91.3	91.3	91.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.4	91.3	91.3	91.3	91.3	91.3	91.3	91.2	91.2	91.2	91.1	91.1	91.1	91.0	91.0	90.9	90.9	90.9	90.8	90.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.8	90.7	90.7	90.7	90.8	90.7	90.7	90.7	90.6	90.6	90.6	90.5	90.5	90.4	90.4	90.3	90.3	90.2	90.2	90.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.1	90.0	89.6	89.1	88.3	87.7	87.8	87.7	87.2	86.6	86.1	85.8	85.3	84.4	81.4	47.3	32.4	30.0	28.5	27.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	25.6	24.0	22.2	20.5	18.9	17.4	16.2	15.0	13.9	13.0	12.4	12.0	12.2	12.3	12.4	13.3	14.5	16.2	16.6	16.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.7	15.0	14.3	13.3	11.8	9.9	7.8	5.6	3.6	2.1	1.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R62

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.2	8.7	44.9	74.1	85.0	88.4	89.5	89.9	90.1	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.2	90.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.2	90.3	90.3	90.4	90.3	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.6	90.7	90.7	90.7	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.9	90.9	90.9				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.552	1.542	1.533	1.528	1.525	1.523	1.521
P	0.911	0.913	0.915	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

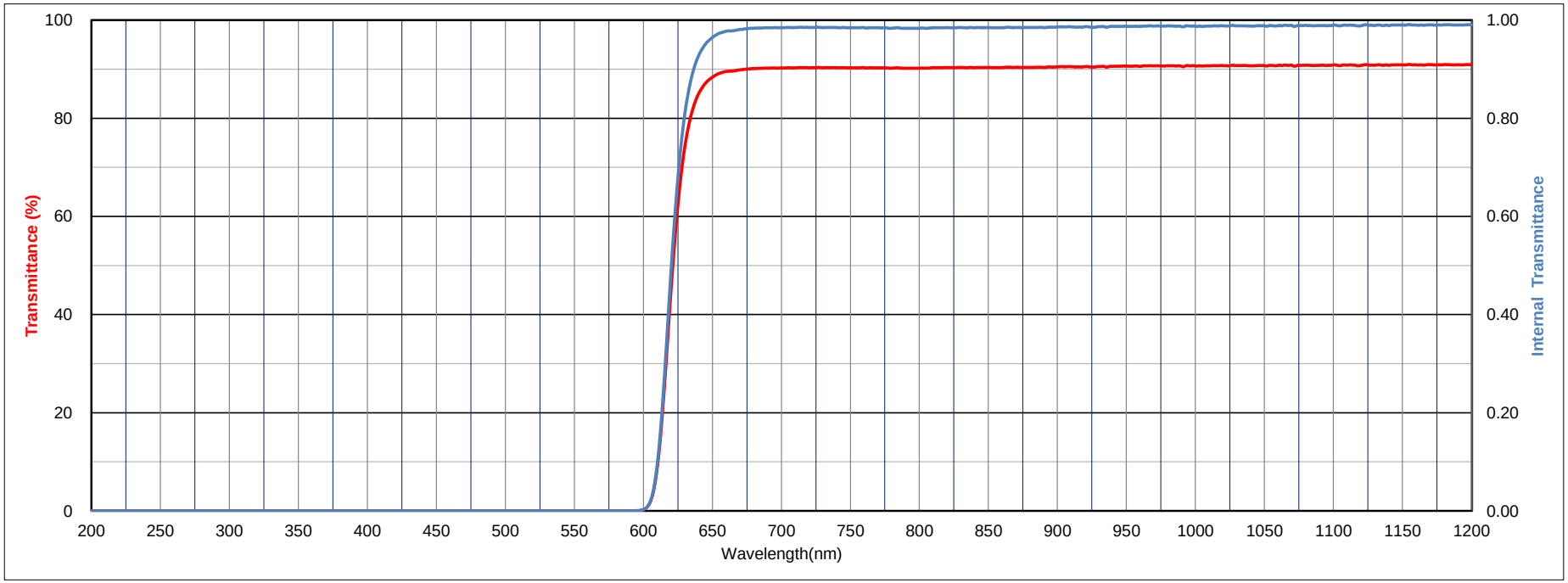
	x	y	Y	λ_d	P_e
A	0.712	0.288	11	633	100
C	0.711	0.289	6	632	100
D65	0.710	0.290	6	632	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	620	95	107	520	140	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
620±5	<25	>85



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HOYA

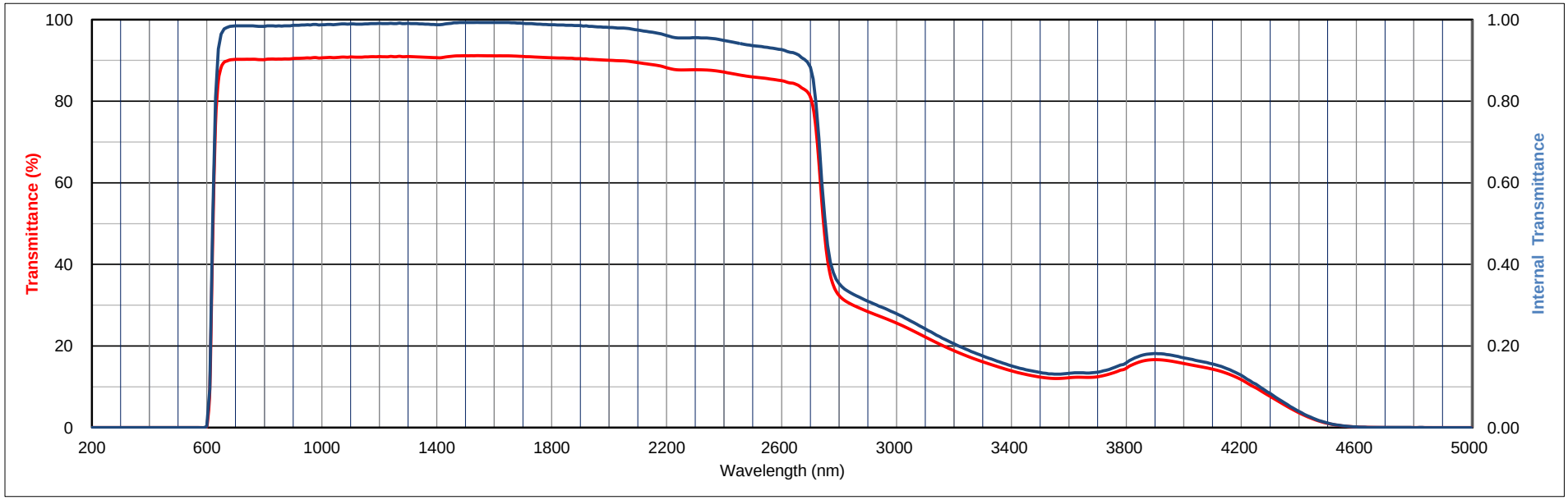
HOYA CORPORATION OPTICS SECTION

Transmittance (T) units: %

Thickness 2.50 mm

R62

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.2	8.7	44.9	74.1	85.0	88.4	89.5	89.9	90.1	90.2	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.2	90.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.2	90.3	90.3	90.4	90.3	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.6	90.7	90.7	90.7	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	90.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.9	90.9	90.9	90.9	91.0	90.9	90.9	91.0	90.9	90.9	91.0	90.9	90.9	90.9	90.8	90.8	90.8	90.8	90.7	90.7
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.7	90.6	90.7	90.8	90.9	91.0	91.1	91.1	91.1	91.1	91.1	91.1	91.2	91.1	91.2	91.2	91.1	91.1	91.1	91.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.0	91.0	90.9	90.9	90.9	90.8	90.8	90.8	90.7	90.7	90.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.7	90.6	90.6	90.6	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.4	90.4	90.3	90.3	90.2	90.2	90.1	90.1	90.1
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.0	89.9	89.5	89.0	88.2	87.7	87.7	87.6	87.1	86.5	85.9	85.6	85.0	84.1	81.1	47.2	32.4	30.0	28.4	27.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	25.6	24.0	22.2	20.5	18.8	17.4	16.1	15.0	13.9	13.0	12.4	12.0	12.2	12.3	12.5	13.3	14.6	16.2	16.7	16.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.7	15.0	14.3	13.3	11.8	9.8	7.6	5.6	3.6	2.1	1.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R64

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.1	0.9	10.0	39.7	70.3	84.2	88.2	89.7	90.1	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.4	90.5	90.5	90.5	90.6	90.5	90.6	90.6	90.5	90.6	90.7	90.8	90.8	90.8	90.8	90.8	90.9	90.9	90.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	91.0	90.9	91.0	91.0	90.9	91.0	90.9	91.0	91.0	91.0	91.0	90.9	91.0	91.1	91.1	91.1				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.551	1.540	1.532	1.527	1.524	1.522	1.521
P	0.911	0.914	0.915	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

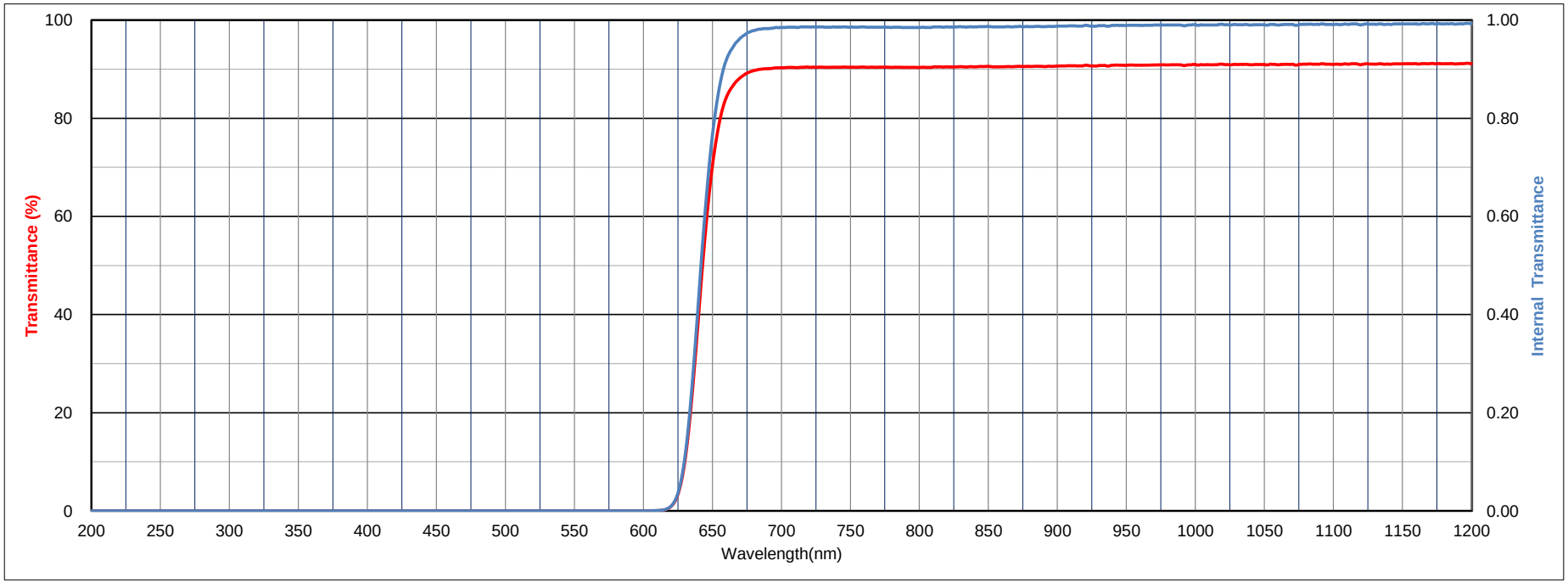
	x	y	Y	λ_d	P_e
A	0.725	0.275	4	648	100
C	0.724	0.276	2	647	100
D65	0.724	0.276	2	647	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	555	620	94	106	520	140	2.68

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
640±5	<35	>85



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HOYA

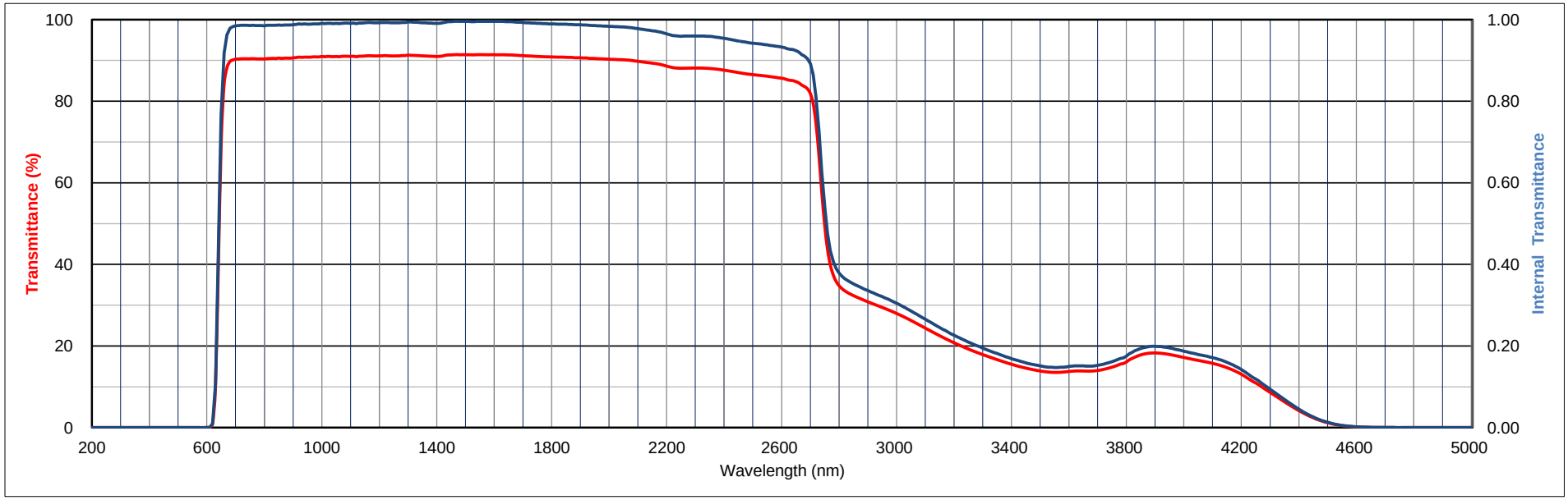
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R64

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.1	0.9	10.0	39.7	70.3	84.2	88.2	89.7	90.1	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.4	90.5	90.5	90.5	90.6	90.5	90.6	90.6	90.5	90.6	90.7	90.8	90.8	90.8	90.8	90.8	90.9	90.9	90.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	91.0	90.9	91.0	91.0	90.9	91.0	90.9	91.0	91.0	91.0	91.0	91.0	90.9	91.0	91.0	91.1	91.1	91.1	91.1	91.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.1	91.1	91.2	91.1	91.1	91.1	91.1	91.1	91.2	91.2	91.3	91.3	91.2	91.2	91.2	91.1	91.1	91.1	91.0	91.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	91.0	91.0	91.1	91.2	91.3	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4	91.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.4	91.4	91.4	91.4	91.4	91.3	91.3	91.3	91.3	91.2	91.2	91.1	91.1	91.1	91.0	91.0	90.9	90.9	90.9	90.9
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.9	90.8	90.8	90.8	90.8	90.8	90.7	90.7	90.7	90.7	90.7	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.4	90.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.3	90.2	89.8	89.3	88.6	88.1	88.1	88.0	87.6	87.0	86.5	86.1	85.6	84.8	81.9	49.7	34.8	32.3	30.8	29.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	28.0	26.3	24.4	22.5	20.8	19.2	17.9	16.7	15.5	14.6	13.9	13.5	13.7	13.9	14.0	14.8	16.1	17.8	18.3	17.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	17.2	16.5	15.7	14.7	13.1	10.9	8.6	6.3	4.2	2.4	1.2	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R66

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.6	9.9	42.3	70.9	84.3	88.5	89.8	90.1	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.5	90.5	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.9	90.9	91.0	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.9	90.9	91.0	91.0	90.9	90.9	91.0	91.1	91.0	91.1	91.1	91.0	91.1	91.1	91.2	91.2				

Refractive Index/Absorption coefficient/Reflection coefficient

λnm	400	500	600	700	800	900	1000
n	1.551	1.542	1.535	1.529	1.526	1.524	1.523
P	0.911	0.913	0.915	0.916	0.917	0.917	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

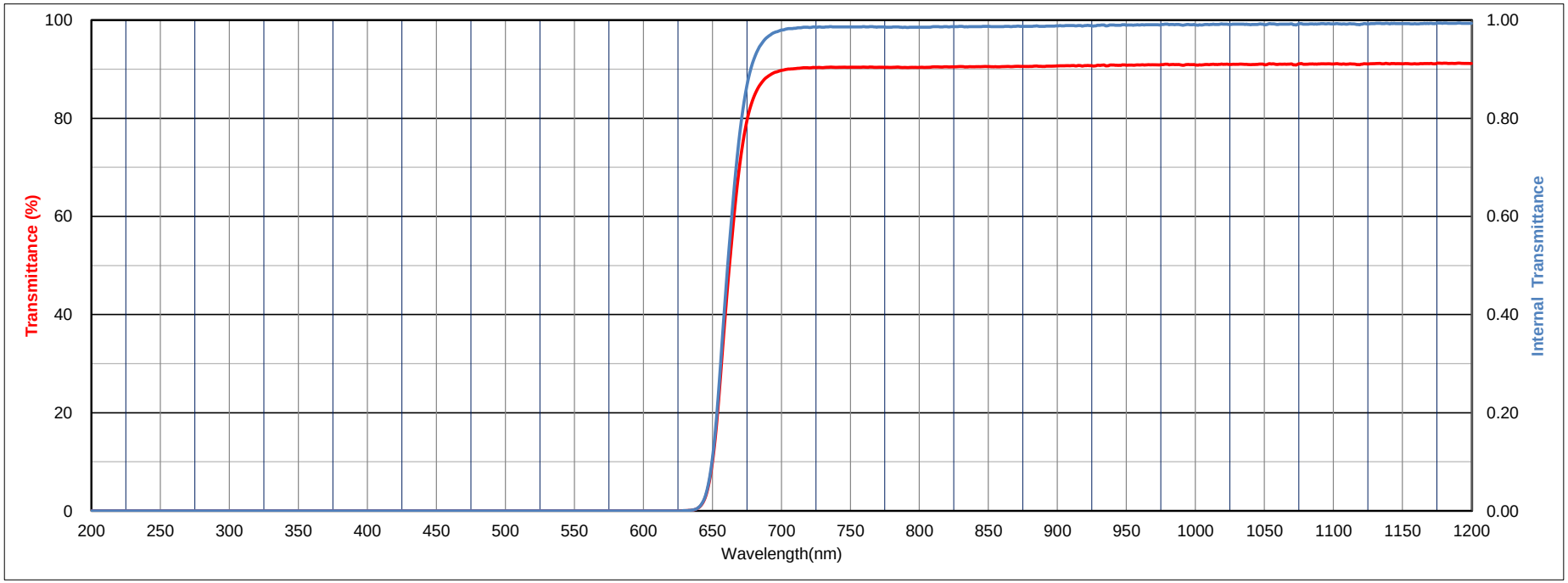
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	530	565	98	117	470	160	2.85

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
660±5	<35	>85



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The content of this catalog is accurate as of October ,2020

HOYA

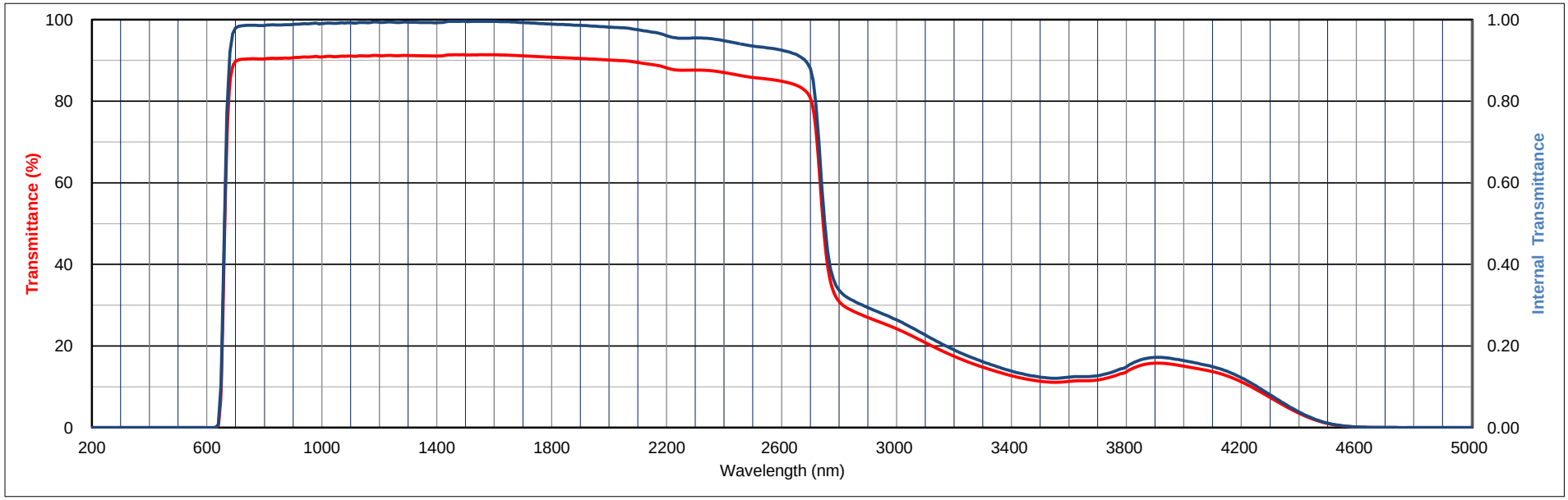
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R66

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.6	9.9	42.3	70.9	84.3	88.5	89.8	90.1	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	90.4	90.5	90.5	90.5	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.7	90.8	90.8	90.8	90.9	90.9	91.0	90.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.9	90.9	91.0	91.0	90.9	90.9	91.0	91.1	91.0	91.1	91.1	91.0	91.0	91.1	91.1	91.1	91.1	91.1	91.2	91.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	91.2	91.1	91.2	91.2	91.2	91.2	91.1	91.1	91.2	91.2	91.2	91.2	91.2	91.2	91.1	91.1	91.1	91.1	91.1	91.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	91.1	91.1	91.1	91.3	91.4	91.3	91.4	91.4	91.4	91.4	91.4	91.3	91.3	91.4	91.4	91.4	91.4	91.4	91.4	91.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.4	91.4	91.3	91.3	91.3	91.3	91.2	91.2	91.2	91.1	91.1	91.1	91.1	91.0	91.0	90.9	90.9	90.9	90.8	90.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.8	90.7	90.7	90.7	90.7	90.6	90.6	90.6	90.5	90.5	90.5	90.4	90.4	90.3	90.3	90.3	90.3	90.2	90.2	90.1
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	90.1	89.9	89.5	89.0	88.2	87.6	87.6	87.5	87.0	86.4	85.8	85.4	84.9	84.0	80.8	45.9	30.9	28.5	27.0	25.6
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.2	22.6	20.8	19.1	17.5	16.0	14.8	13.7	12.7	11.9	11.4	11.1	11.3	11.5	11.7	12.5	13.7	15.3	15.8	15.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	15.0	14.4	13.7	12.7	11.2	9.4	7.4	5.4	3.5	2.1	1.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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Infrared Transmitting Filters

Infrared Transmitting Filters absorb most of the visible region and transmit in the infrared region.
This type consists of the R and IR series that have relatively sharp transitions from the visible region, the RM series that gradually transitions from the visible region, and the RT series that has band-pass function in the infrared region.
Infrared transmitting filters are used in security systems utilizing infrared rays, night-vision devices and similar applications.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R70

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	14.2	44.0	68.9	81.1	86.2	88.2	89.1	89.5	89.7	89.8	89.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.9	90.0	90.0	90.0	90.0	90.1	90.2	90.1	90.1	90.2	90.2	90.3	90.4	90.4	90.5	90.4	90.4	90.5	90.5	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	90.6	90.6	90.7	90.6	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.7	90.8	90.8	90.8	90.8				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.562	1.552	1.546	1.543	1.541	1.540	1.539
P	0.908	0.911	0.912	0.913	0.913	0.914	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

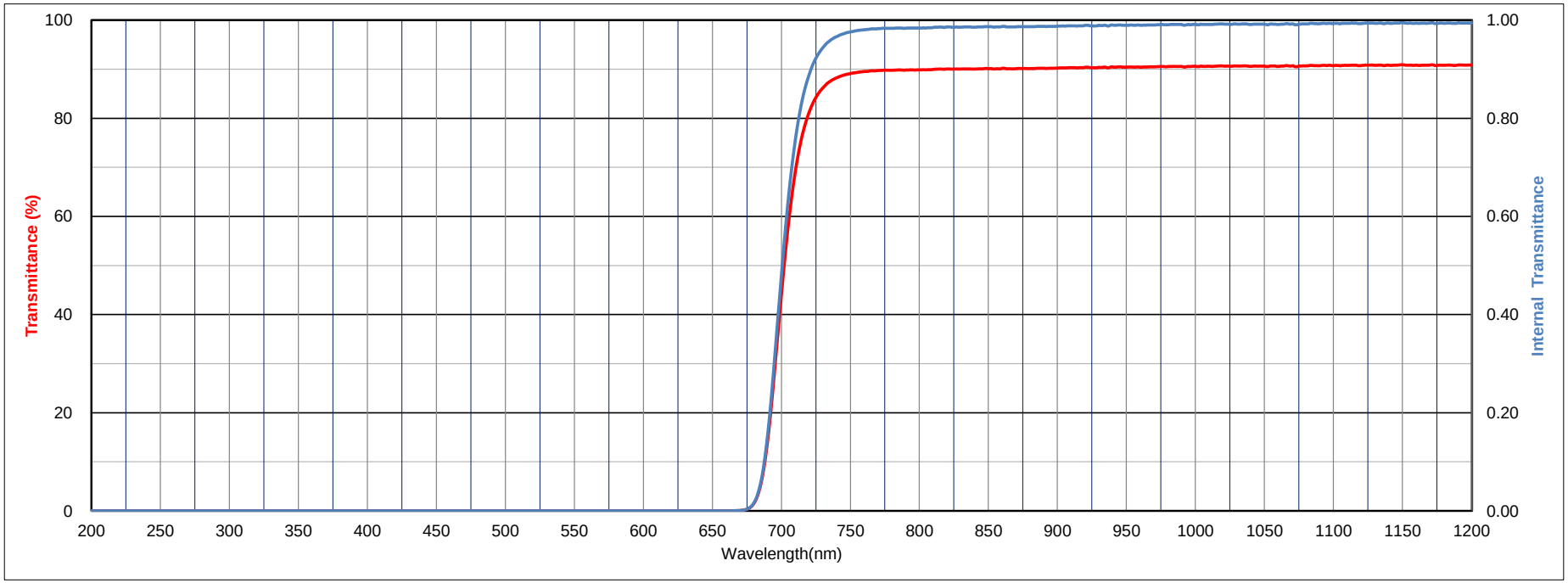
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	525	575	98	115	470	160	2.86

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
700±10	<45	>85



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HOYA

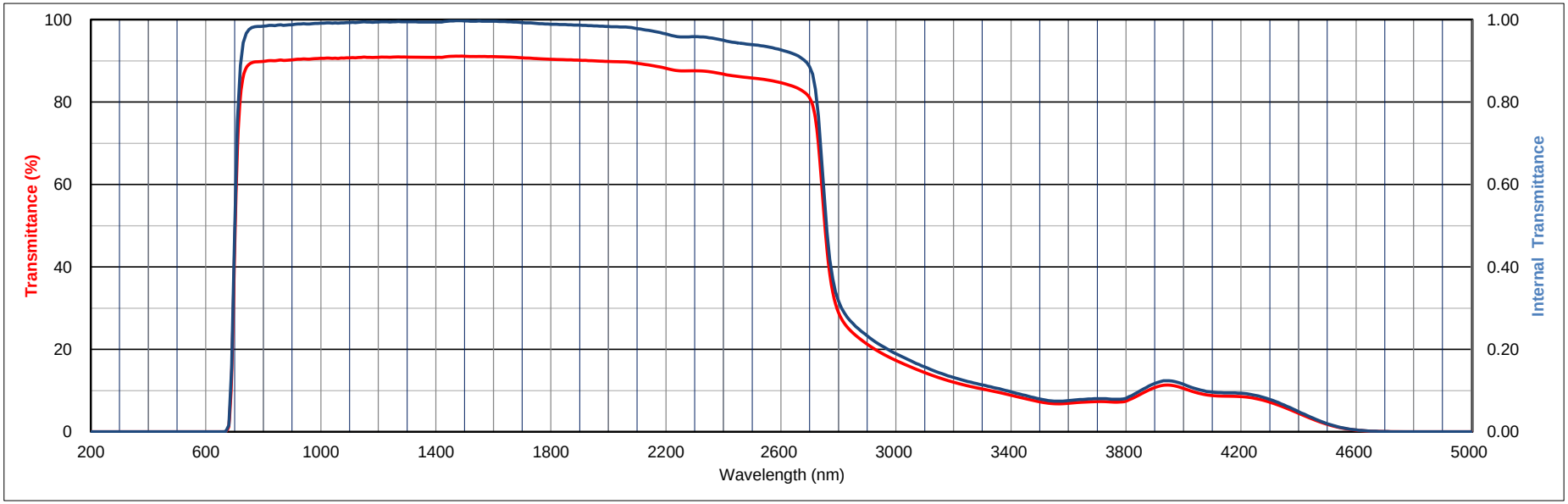
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R70

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	14.2	44.0	68.9	81.1	86.2	88.2	89.1	89.5	89.7	89.8	89.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	89.9	90.0	90.0	90.0	90.0	90.1	90.2	90.1	90.1	90.2	90.2	90.3	90.4	90.4	90.5	90.4	90.4	90.5	90.5	90.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	90.6	90.6	90.7	90.6	90.6	90.6	90.6	90.7	90.7	90.7	90.7	90.8	90.7	90.8	90.8	90.9	90.8	90.8	90.8	90.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.8	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.9	90.8	90.8	90.8	90.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.8	90.9	90.8	90.9	91.0	91.1	91.1	91.1	91.1	91.1	91.1	91.1	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	91.0	91.0	91.0	91.0	90.9	90.9	90.9	90.9	90.8	90.8	90.7	90.7	90.7	90.6	90.6	90.5	90.5	90.5	90.4	90.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	90.4	90.3	90.3	90.3	90.3	90.3	90.2	90.2	90.2	90.2	90.1	90.1	90.1	90.0	90.0	90.0	90.0	89.9	89.9	89.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	89.8	89.7	89.4	88.9	88.2	87.6	87.6	87.4	86.8	86.2	85.8	85.4	84.7	83.6	81.0	52.4	29.0	24.0	21.2	19.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	17.3	15.8	14.4	13.1	12.0	11.1	10.4	9.7	8.9	8.0	7.3	6.8	6.9	7.2	7.3	7.2	7.4	9.1	10.7	11.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	10.5	9.4	8.8	8.6	8.5	8.1	7.2	5.9	4.5	3.0	1.8	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R72

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	10.5	45.0	71.2	81.4	84.9	86.1	86.7	87.1	87.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	87.4	87.6	87.8	87.9	88.0	88.2	88.2	88.4	88.5	88.6	88.7	88.8	88.9	88.9	89.1	89.1	89.2	89.3	89.3	89.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	89.4	89.5	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.8	89.9	90.0	89.9	90.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.565	1.554	1.547	1.543	1.540	1.538	1.537
P	0.907	0.910	0.912	0.913	0.914	0.914	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

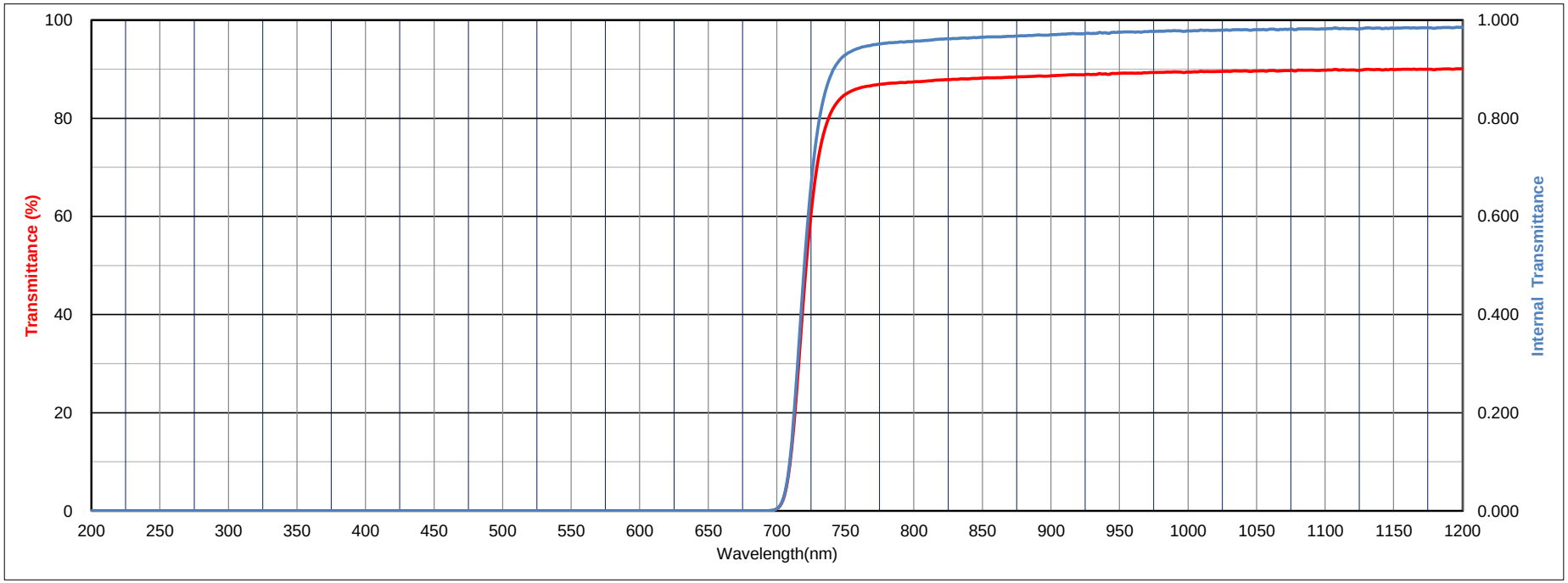
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	525	575	100	116	470	160	2.86

Tolerance of Transmittance (τ)

λτ (nm)	⊿λ (nm)	TH (%)
720±10	<45	>85



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

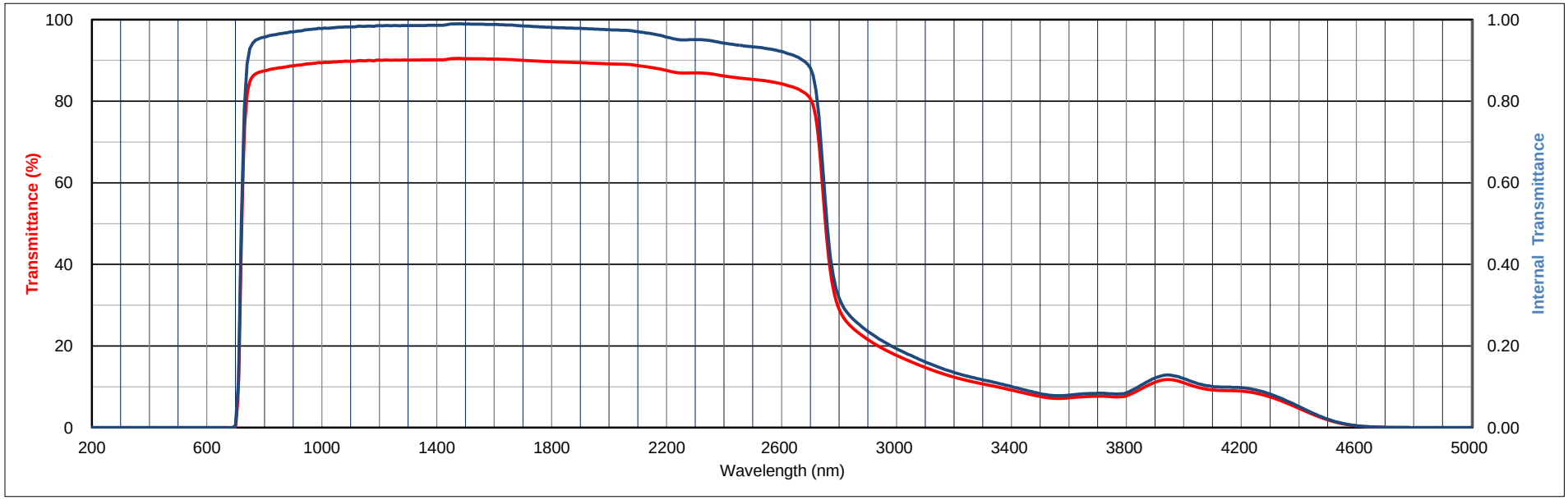
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

R72

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	10.5	45.0	71.2	81.4	84.9	86.1	86.7	87.1	87.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	87.4	87.6	87.8	87.9	88.0	88.2	88.2	88.4	88.5	88.6	88.7	88.8	88.9	88.9	89.1	89.1	89.2	89.3	89.3	89.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	89.4	89.5	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.8	89.8	90.0	89.9	89.9	90.0	90.0	89.9	90.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	90.1	90.0	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1	90.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	90.1	90.1	90.1	90.2	90.3	90.4	90.4	90.5	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.4	90.3	90.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	90.3	90.3	90.3	90.3	90.2	90.2	90.2	90.2	90.1	90.1	90.0	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.7	89.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	89.7	89.7	89.6	89.6	89.6	89.6	89.5	89.5	89.5	89.5	89.5	89.4	89.4	89.3	89.3	89.3	89.3	89.2	89.2	89.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	89.1	89.1	88.7	88.2	87.5	86.9	86.9	86.7	86.2	85.7	85.3	84.9	84.3	83.2	80.6	52.3	29.1	24.2	21.6	19.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	17.7	16.1	14.7	13.4	12.4	11.5	10.7	10.0	9.2	8.4	7.6	7.2	7.3	7.6	7.7	7.6	7.7	9.4	11.1	11.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	11.0	9.8	9.2	9.1	8.9	8.4	7.5	6.2	4.7	3.2	1.9	1.0	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
τ	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

IR76N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.8	12.8	38.5	63.7	77.5	83.7
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	86.3	87.3	87.9	88.2	88.3	88.5	88.6	88.7	88.8	88.9	89.0	89.0	89.1	89.2	89.3	89.4	89.3	89.4	89.4	89.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.5	89.6	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.8	89.8	89.9	89.9	89.9	89.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.576	1.567	1.561	1.556	1.553	1.551	1.550
P	0.905	0.907	0.908	0.910	0.910	0.911	0.911

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

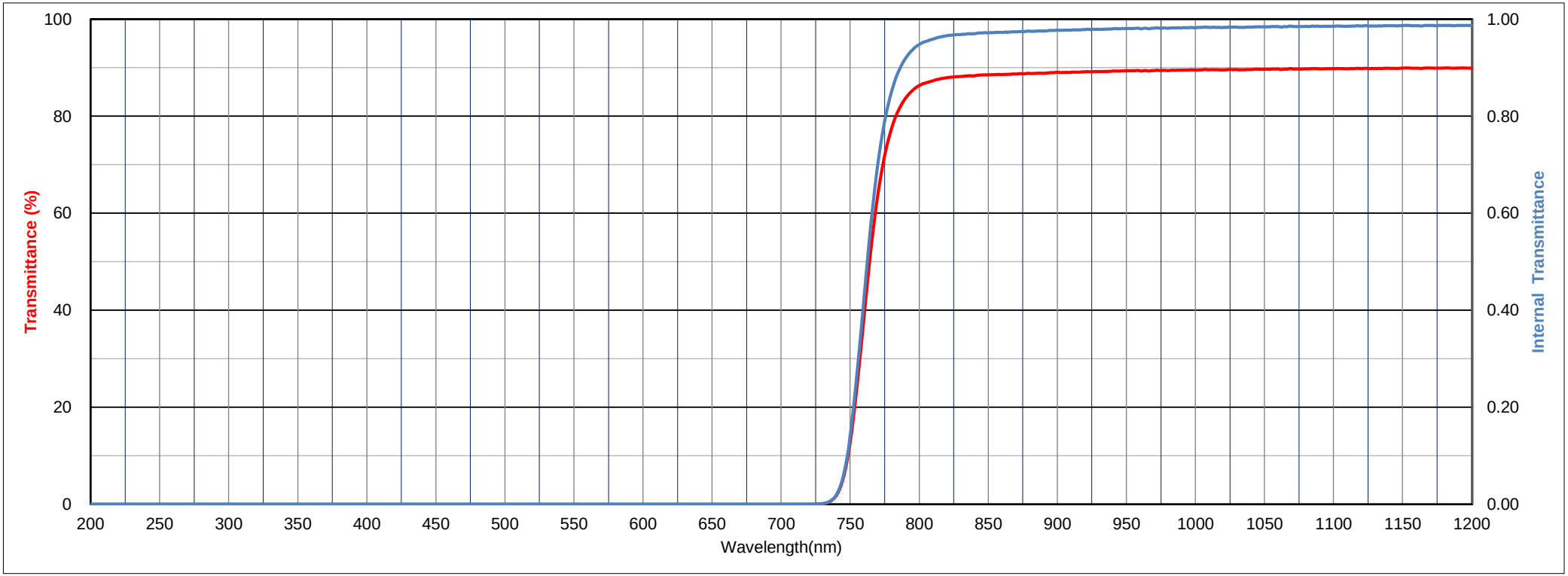
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	495	545	89	99	500	160	2.84

Tolerance of Transmittance (T)

λT (nm)	⊿λ (nm)
760±10	<60



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The content of this catalog is accurate as of October ,2020

HOYA

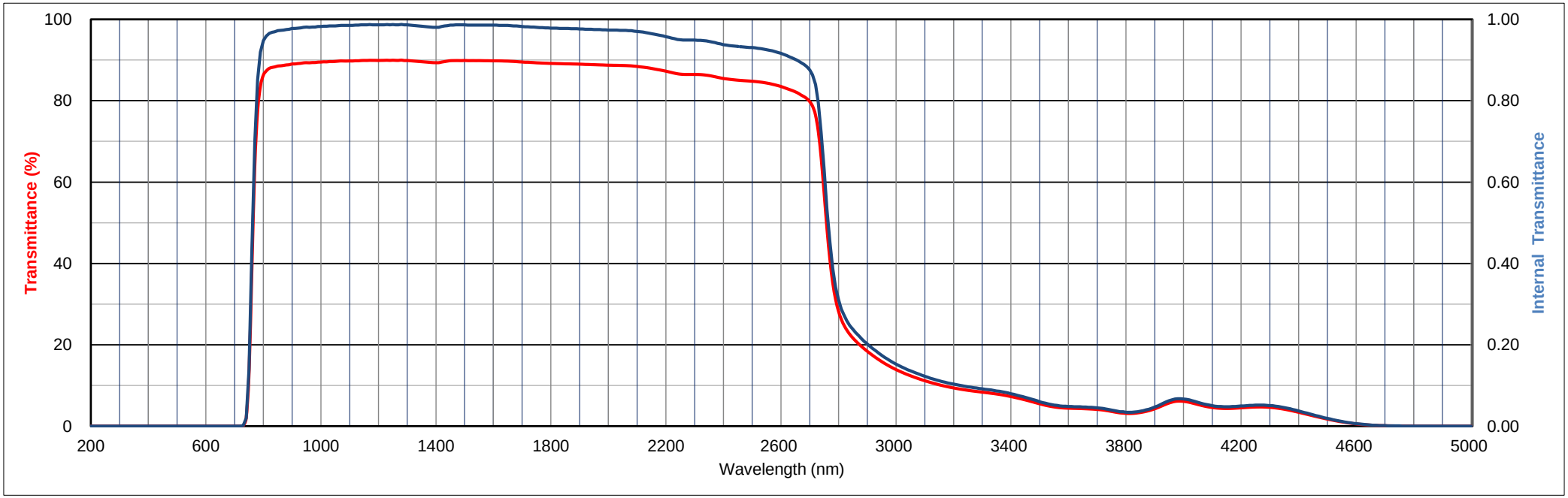
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness 2.50 mm

IR76N

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.8	12.8	38.5	63.7	77.5	83.7
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	86.3	87.3	87.9	88.2	88.3	88.5	88.6	88.7	88.8	88.9	89.0	89.0	89.1	89.2	89.3	89.4	89.3	89.4	89.4	89.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.5	89.6	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.9	89.9	89.9	89.9	89.9	89.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	89.9	89.9	89.9	89.9	89.9	90.0	89.9	89.9	90.0	89.9	89.9	89.8	89.8	89.7	89.7	89.6	89.5	89.5	89.4	89.4
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.4	89.4	89.5	89.6	89.7	89.8	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.8	89.8	89.8	89.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.8	89.8	89.8	89.8	89.8	89.7	89.7	89.7	89.6	89.6	89.5	89.5	89.5	89.4	89.4	89.3	89.3	89.3	89.2	89.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.2	89.2	89.1	89.1	89.1	89.1	89.1	89.0	89.0	89.0	89.0	89.0	88.9	88.9	88.9	88.9	88.8	88.8	88.8	88.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.7	88.7	88.4	87.9	87.3	86.5	86.5	86.2	85.5	85.0	84.8	84.3	83.5	82.2	79.8	57.4	28.3	21.7	18.4	15.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	13.9	12.4	11.2	10.2	9.4	8.8	8.4	7.9	7.3	6.4	5.5	4.7	4.4	4.3	4.1	3.6	3.1	3.4	4.3	5.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	6.1	5.3	4.6	4.3	4.5	4.7	4.6	4.2	3.4	2.5	1.7	1.1	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

IR80N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	3.9	14.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	36.9	59.4	74.8	82.3	85.7	87.2	87.8	88.2	88.4	88.6	88.8	88.9	89.0	89.1	89.2	89.2	89.3	89.2	89.4	89.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.4	89.5	89.5	89.5	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.8	89.8	89.8	89.9	89.8				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.582	1.570	1.563	1.557	1.554	1.551	1.550
P	0.903	0.906	0.908	0.909	0.910	0.911	0.911

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

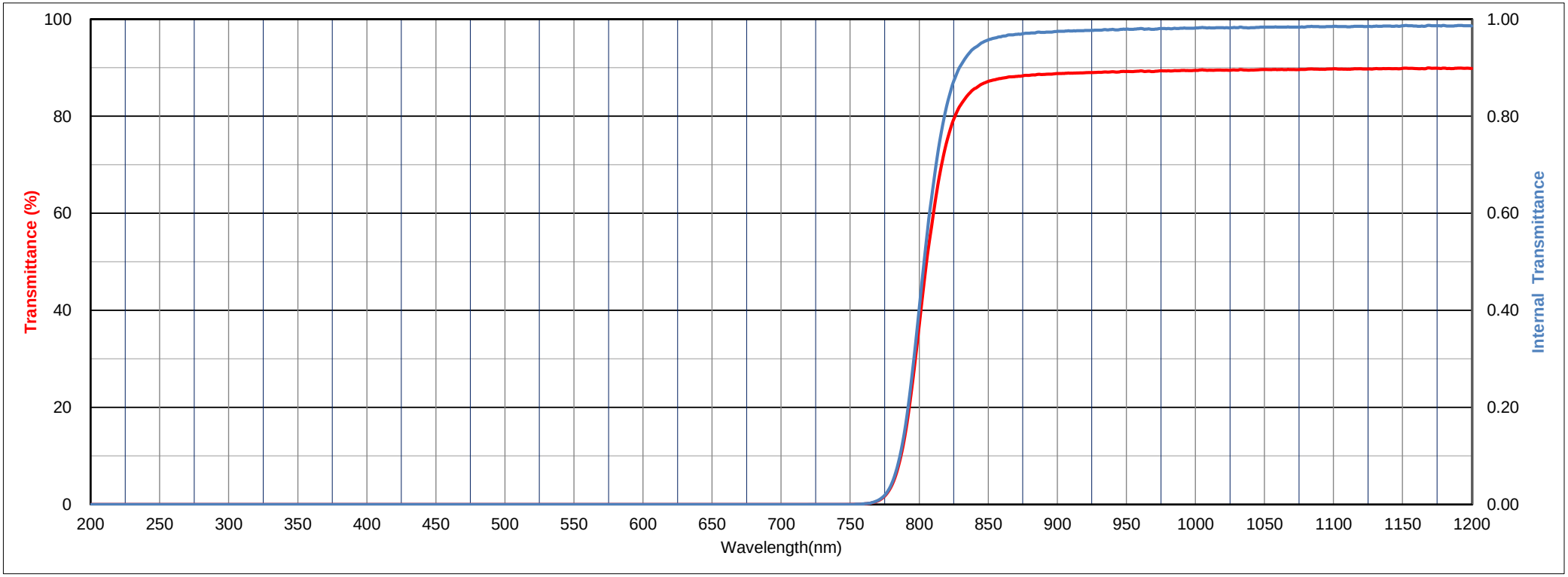
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	495	550	87	100	500	160	2.85

Tolerance of Transmittance (T)

λT (nm)	⊿λ (nm)
800±10	<60



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HOYA

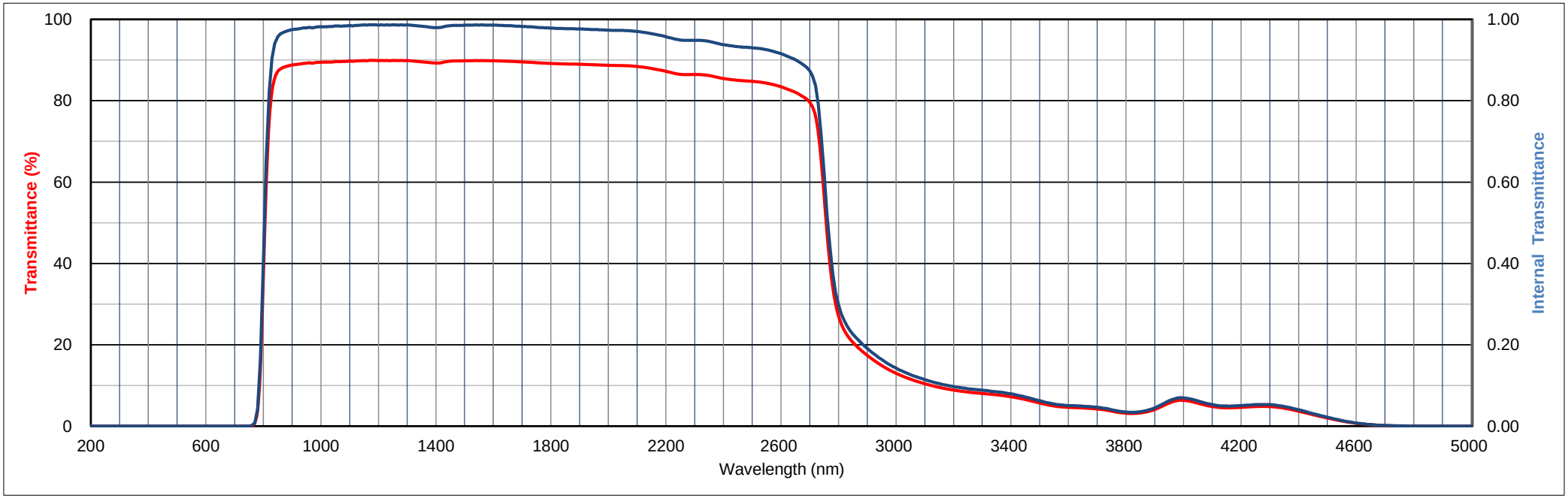
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

IR80N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	3.9	14.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	36.9	59.4	74.8	82.3	85.7	87.2	87.8	88.2	88.4	88.6	88.8	88.9	89.0	89.1	89.2	89.2	89.3	89.2	89.4	89.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.4	89.5	89.5	89.5	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.7	89.8	89.8	89.8	89.9	89.8	89.9	89.9	89.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	89.8	89.9	89.9	89.9	89.8	89.9	89.9	89.9	89.9	89.8	89.9	89.8	89.8	89.7	89.6	89.6	89.5	89.4	89.4	89.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.3	89.3	89.3	89.5	89.6	89.7	89.8	89.8	89.8	89.8	89.8	89.8	89.8	89.9	89.9	89.8	89.9	89.8	89.9	89.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.8	89.8	89.8	89.7	89.7	89.7	89.7	89.6	89.6	89.6	89.5	89.5	89.5	89.4	89.4	89.3	89.3	89.3	89.2	89.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.2	89.1	89.1	89.1	89.1	89.0	89.0	89.0	89.0	89.0	89.0	88.9	88.9	88.9	88.9	88.8	88.8	88.8	88.8	88.7
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.7	88.6	88.4	87.9	87.2	86.5	86.5	86.2	85.4	85.0	84.8	84.3	83.4	82.1	79.6	56.6	27.2	20.6	17.4	14.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	13.0	11.6	10.4	9.5	8.9	8.4	8.0	7.7	7.2	6.5	5.7	5.0	4.6	4.5	4.2	3.7	3.2	3.2	4.1	5.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	6.3	5.6	4.8	4.5	4.6	4.8	4.8	4.4	3.7	2.8	2.0	1.3	0.7	0.3	0.2	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

IR83N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.0	4.3	14.7	36.5	59.3	74.9	82.5	85.7	87.0	87.8	88.1	88.4	88.6	88.7	88.8	88.9	89.0	89.0	89.1	89.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.2	89.3	89.3	89.3	89.3	89.4	89.4	89.4	89.5	89.6	89.6	89.6	89.6	89.7	89.7	89.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.588	1.576	1.569	1.563	1.560	1.558	1.556
P	0.902	0.905	0.906	0.908	0.909	0.909	0.910

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

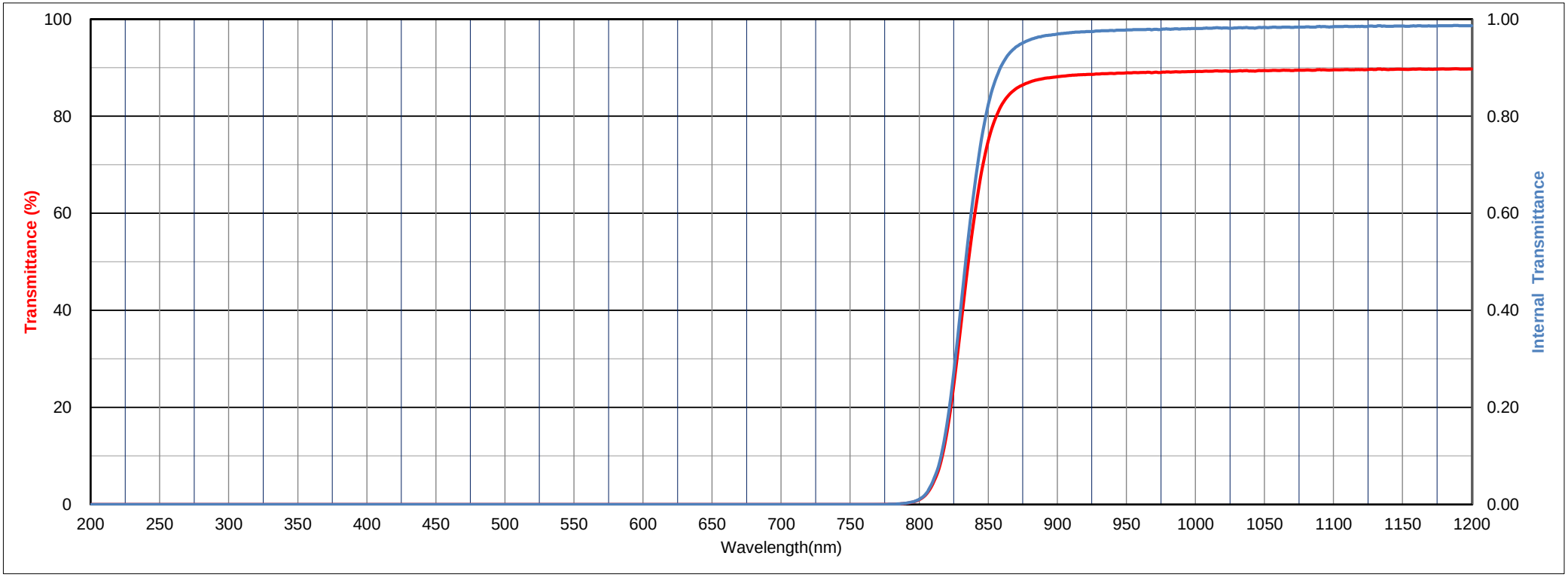
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	4	500	555	99	109	500	160	2.99

Tolerance of Transmittance (T)

λT (nm)	⊿λ (nm)
830±10	<60



All data is mean values of various melts.

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HOYA

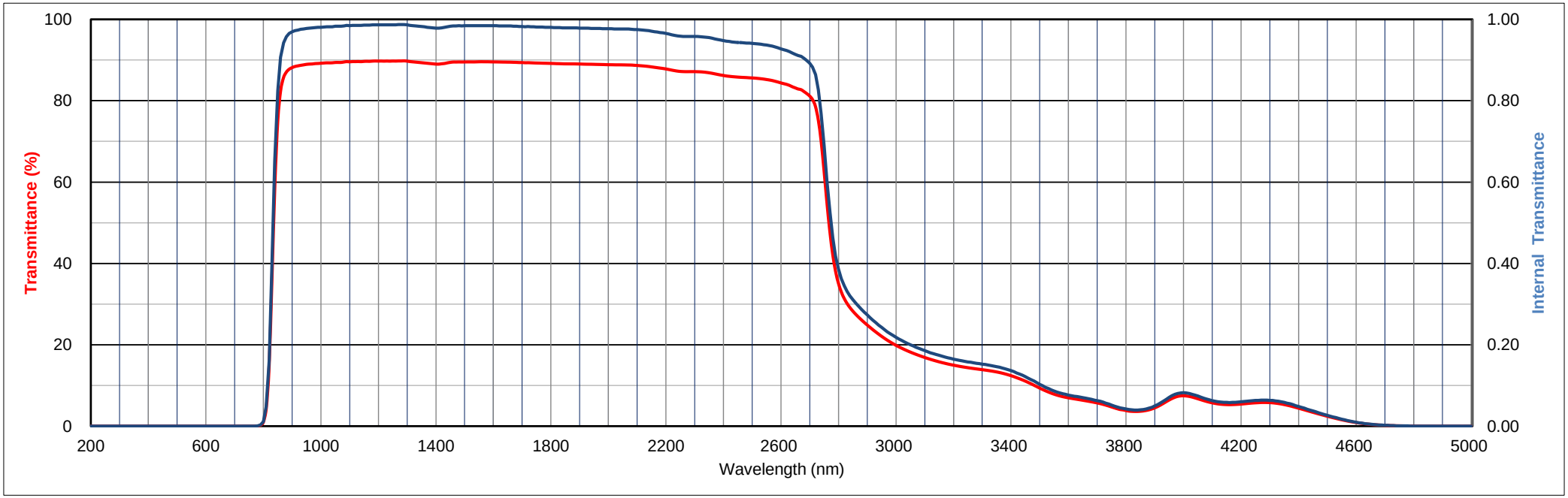
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness 2.50 mm

IR83N

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.0	4.3	14.7	36.5	59.3	74.9	82.5	85.7	87.0	87.8	88.1	88.4	88.6	88.7	88.8	88.9	89.0	89.0	89.1	89.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.2	89.3	89.3	89.3	89.3	89.4	89.4	89.4	89.5	89.6	89.6	89.6	89.6	89.6	89.6	89.7	89.7	89.7	89.7	89.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	89.7	89.8	89.7	89.8	89.7	89.8	89.7	89.8	89.8	89.8	89.7	89.6	89.6	89.5	89.4	89.4	89.3	89.2	89.1	89.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.0	89.0	89.1	89.2	89.3	89.4	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.6	89.6	89.6	89.6	89.6	89.6
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.4	89.4	89.4	89.4	89.3	89.3	89.3	89.3	89.3	89.3	89.2	89.2	89.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.2	89.2	89.1	89.1	89.1	89.1	89.1	89.1	89.1	89.0	89.0	89.0	89.0	89.0	89.0	88.9	88.9	88.9	88.9	88.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.9	88.8	88.7	88.3	87.8	87.2	87.1	86.9	86.2	85.8	85.6	85.2	84.4	83.2	81.1	62.7	35.1	28.3	24.9	22.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	19.9	18.2	16.9	15.8	15.0	14.4	13.9	13.3	12.4	11.1	9.4	7.9	7.0	6.4	5.7	4.7	3.8	3.7	4.5	6.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	7.5	6.7	5.7	5.3	5.4	5.7	5.8	5.3	4.4	3.4	2.4	1.6	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

IR85N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.1	0.6	3.8	15.9	39.1	60.8	73.7	80.2	83.7	85.5	86.5	87.2	87.6	87.9	88.1	88.4	88.5	88.7	88.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.0	89.1	89.2	89.3	89.4	89.5	89.6	89.7	89.7	89.8	89.8	90.0	90.1	90.2	90.3	90.3				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.589	1.578	1.572	1.566	1.563	1.560	1.559
P	0.902	0.904	0.906	0.907	0.908	0.909	0.909

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

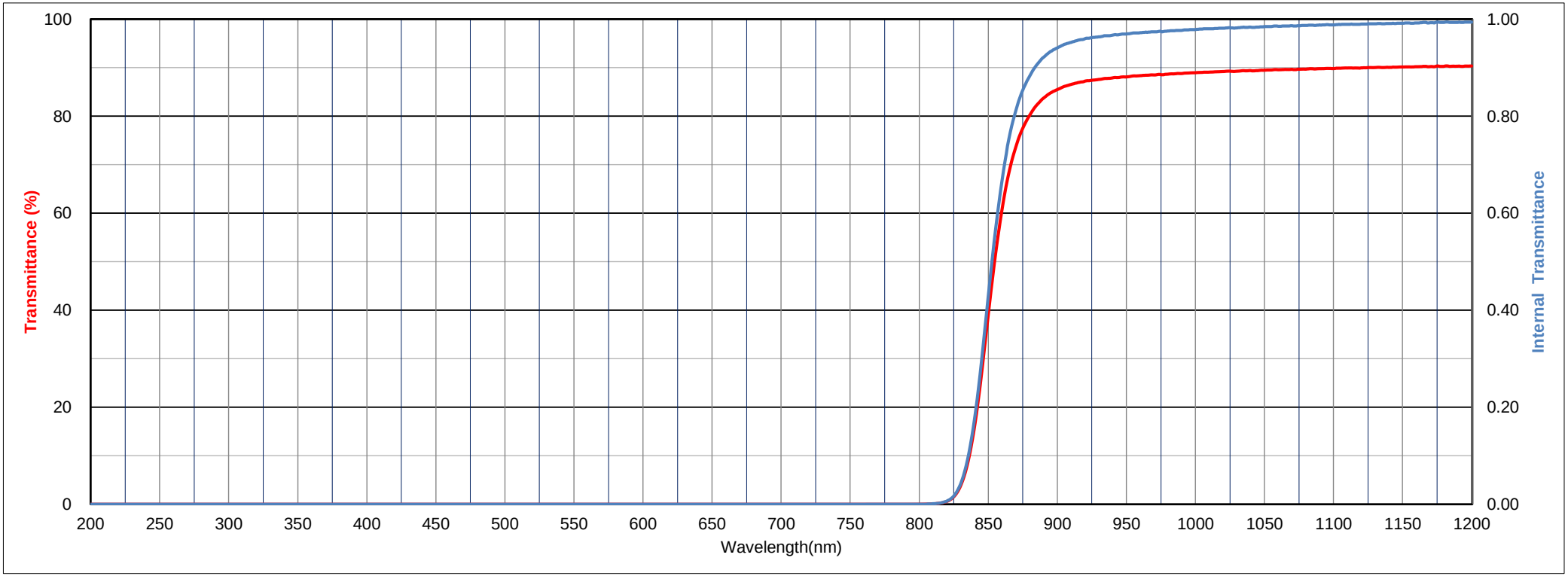
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	4	490	535	92	102	500	150	3.02

Tolerance of Transmittance (T)

λT (nm)	⊿λ (nm)
850±10	<60



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

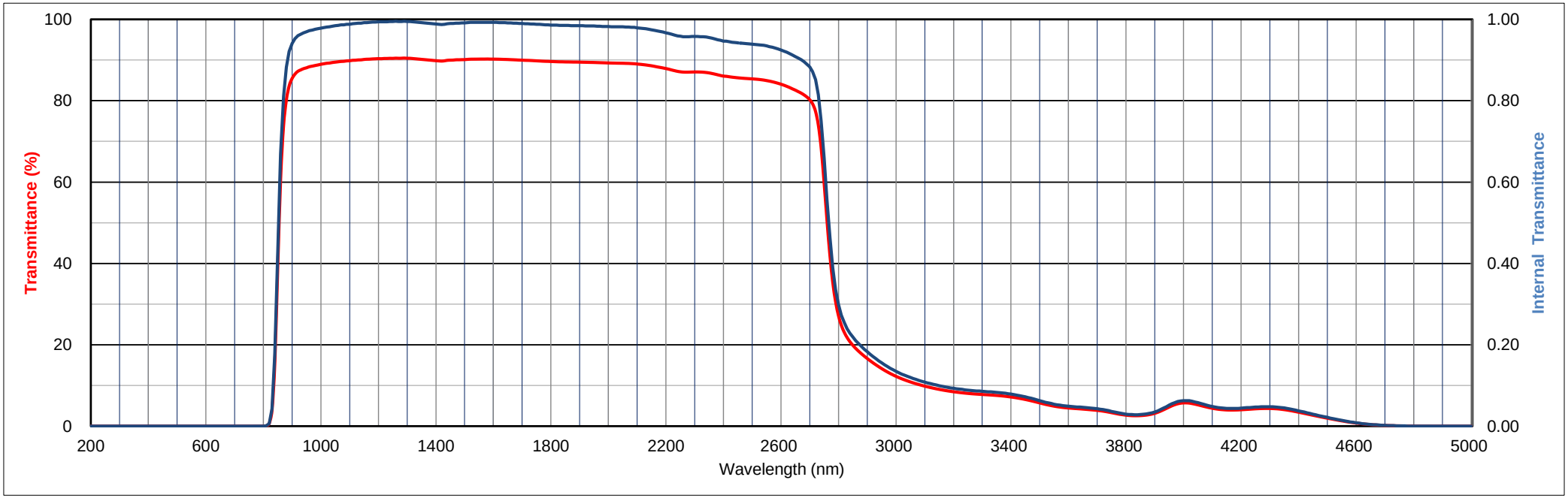
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness 2.50 mm

IR85N

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.1	0.6	3.8	15.9	39.1	60.8	73.7	80.2	83.7	85.5	86.5	87.2	87.6	87.9	88.1	88.4	88.5	88.7	88.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.0	89.1	89.2	89.3	89.4	89.5	89.6	89.7	89.7	89.8	89.8	89.9	90.0	90.0	90.1	90.2	90.2	90.2	90.3	90.3
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.3	90.3	90.4	90.4	90.4	90.4	90.5	90.4	90.4	90.5	90.4	90.4	90.4	90.3	90.2	90.2	90.1	90.0	90.0	89.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.8	89.8	89.8	89.8	89.9	90.0	90.0	90.1	90.1	90.1	90.1	90.2	90.2	90.2	90.2	90.2	90.2	90.2	90.3	90.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.2	90.2	90.2	90.2	90.2	90.1	90.1	90.1	90.0	90.0	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.7	89.7	89.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.6	89.6	89.6	89.6	89.6	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.5	89.4	89.4	89.4	89.4	89.4	89.3	89.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.3	89.2	89.0	88.6	87.9	87.1	87.1	86.8	86.1	85.6	85.4	85.0	84.1	82.6	80.3	59.9	27.2	19.9	16.6	14.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	12.3	10.9	9.8	9.0	8.5	8.1	7.8	7.6	7.2	6.6	5.7	4.9	4.5	4.2	3.9	3.3	2.7	2.6	3.2	4.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	5.7	5.2	4.4	4.0	4.0	4.3	4.3	4.1	3.4	2.7	2.0	1.3	0.8	0.4	0.2	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RM90

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.2	1.8	2.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	4.1	5.8	8.0	10.7	13.9	17.8	21.9	26.3	30.8	35.6	40.3	45.0	49.5	53.7	57.6	61.1	64.3	67.3	69.9	72.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	74.3	76.2	77.8	79.2	80.4	81.5	82.5	83.3	84.0	84.6	85.3	86.1	86.9	87.4	87.8	88.2				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.573	1.556	1.549	1.544	1.541	1.539	1.537
P	0.905	0.910	0.911	0.913	0.913	0.914	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

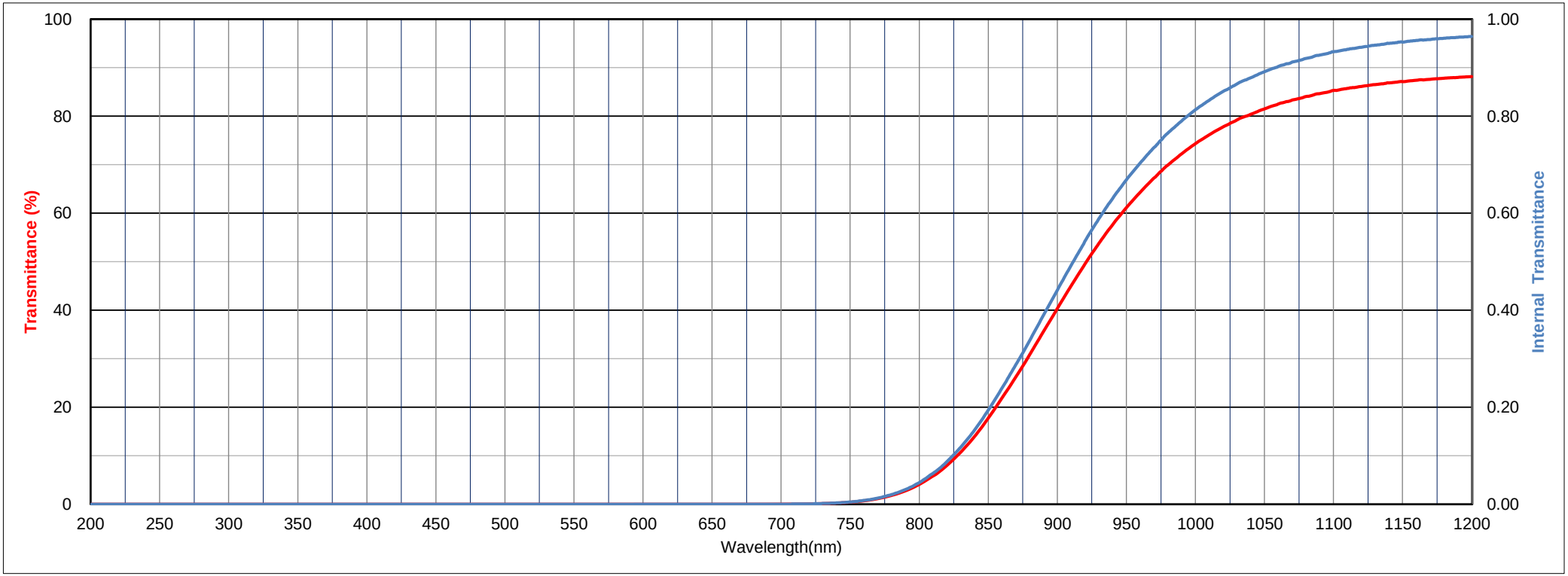
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	3	400	490	107	125	450	170	3.15

Tolerance of Transmittance (T)

Wavelength for less than 5% Transmittance	Transmittance at 1200nm
λ5(nm)	λ80(nm)
>770	<1050



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The content of this catalog is accurate as of October ,2020

HOYA

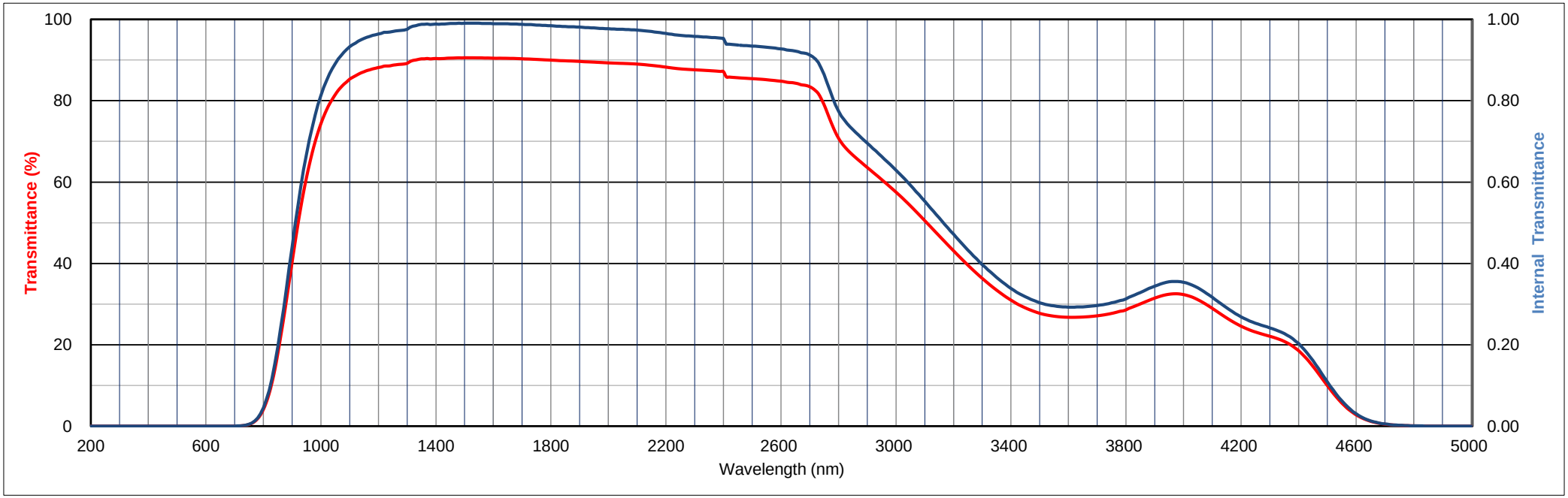
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RM90

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.2	1.8	2.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	4.1	5.8	8.0	10.7	13.9	17.8	21.9	26.3	30.8	35.6	40.3	45.0	49.5	53.7	57.6	61.1	64.3	67.3	69.9	72.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	74.3	76.2	77.8	79.2	80.4	81.5	82.5	83.3	84.0	84.6	85.3	85.7	86.1	86.5	86.9	87.1	87.4	87.6	87.8	88.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	88.2	88.3	88.5	88.5	88.6	88.7	88.8	88.9	89.0	89.0	89.2	89.6	89.9	90.0	90.2	90.3	90.3	90.4	90.3	90.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.4	90.3	90.4	90.4	90.5	90.5	90.5	90.5	90.6	90.5	90.6	90.6	90.6	90.6	90.5	90.5	90.5	90.5	90.5	90.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.5	90.4	90.5	90.4	90.4	90.4	90.4	90.4	90.4	90.3	90.3	90.3	90.3	90.2	90.2	90.2	90.1	90.1	90.0	90.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	90.0	89.9	89.9	89.9	89.8	89.8	89.8	89.8	89.7	89.7	89.7	89.6	89.6	89.6	89.5	89.5	89.5	89.4	89.4	89.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.3	89.2	89.0	88.7	88.3	87.8	87.6	87.4	87.2	85.6	85.4	85.2	84.8	84.3	83.4	79.0	70.8	66.6	63.6	60.6
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	57.5	54.2	50.5	46.8	43.1	39.6	36.3	33.4	31.0	29.1	27.7	27.0	26.8	26.8	27.1	27.7	28.6	30.1	31.5	32.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	32.3	31.1	29.0	26.6	24.6	23.1	22.1	20.8	18.6	14.7	10.0	5.7	2.8	1.2	0.5	0.2	0.1	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RM100

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.2	0.4	0.8	1.3	2.1	3.3	4.9	6.9	9.2	12.1	15.4	19.0	22.9	26.9	31.0	35.0	38.8	42.7	46.4	49.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	53.1	56.2	59.0	61.6	63.8	66.0	68.0	69.7	71.2	72.6	73.8	75.9	77.4	78.6	79.4	80.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.650	1.630	1.620	1.614	1.610	1.607	1.605
P	0.887	0.892	0.894	0.895	0.896	0.897	0.898

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

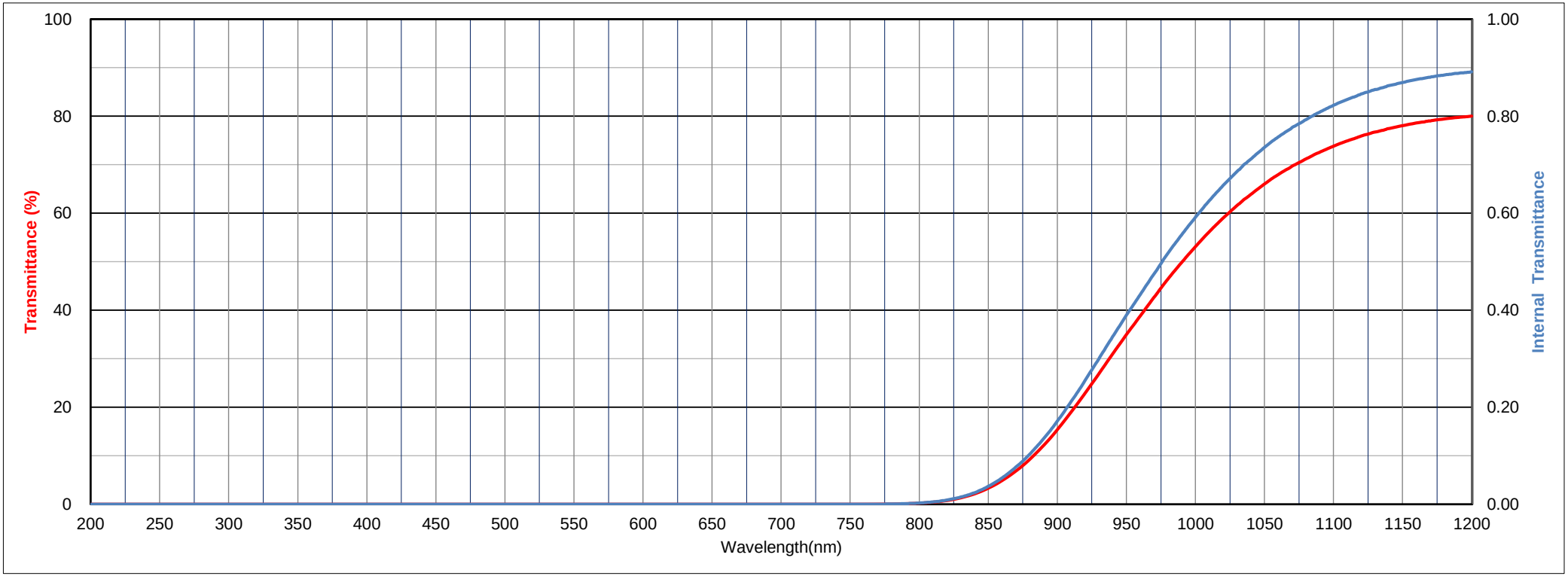
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	4	450	490	98	115	460	180	3.23

Tolerance of Transmittance (T)

Wavelength for less than 5% Transmittance	Transmittance at 1200nm
λ5(nm)	T1200(%)
>850	80±5



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The content of this catalog is accurate as of October ,2020

HOYA

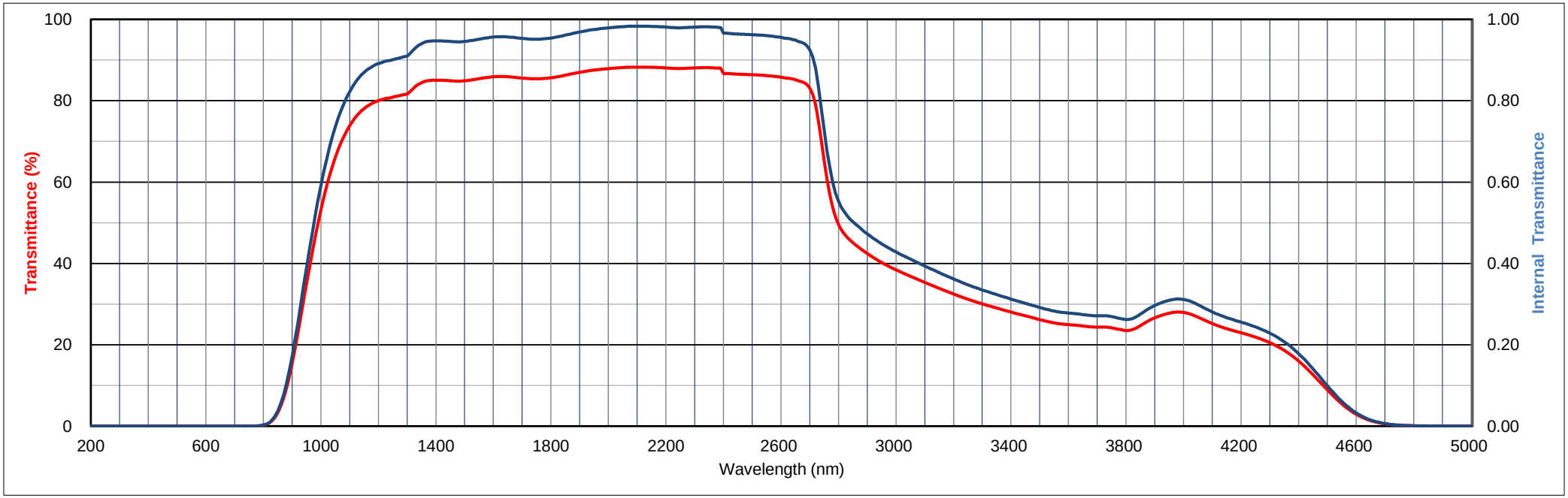
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RM100

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.2	0.4	0.8	1.3	2.1	3.3	4.9	6.9	9.2	12.1	15.4	19.0	22.9	26.9	31.0	35.0	38.8	42.7	46.4	49.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	53.1	56.2	59.0	61.6	63.8	66.0	68.0	69.7	71.2	72.6	73.8	74.9	75.9	76.7	77.4	78.0	78.6	79.0	79.4	79.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	80.0	80.2	80.4	80.6	80.7	80.9	81.1	81.2	81.4	81.5	81.6	82.2	82.9	83.6	84.1	84.4	84.7	84.9	85.0	85.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	85.0	85.0	85.0	85.0	85.0	84.9	84.9	84.8	84.8	84.9	84.9	85.0	85.1	85.2	85.3	85.4	85.5	85.7	85.7	85.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	85.9	85.9	86.0	86.0	86.0	85.9	85.8	85.8	85.7	85.6	85.6	85.5	85.5	85.4	85.4	85.4	85.4	85.4	85.5	85.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	85.6	85.7	85.9	86.0	86.1	86.3	86.4	86.6	86.7	86.8	87.0	87.1	87.2	87.3	87.4	87.5	87.6	87.7	87.8	87.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	87.9	88.2	88.2	88.2	88.1	87.9	88.1	88.1	86.8	86.5	86.4	86.2	85.8	85.2	83.1	65.4	49.6	45.1	42.4	40.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	38.4	36.9	35.3	33.9	32.5	31.2	30.1	29.0	28.0	27.1	26.2	25.4	25.0	24.6	24.3	24.2	23.5	24.7	26.6	27.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	28.0	26.8	25.2	24.0	23.0	21.9	20.5	18.6	16.0	12.7	8.9	5.5	2.9	1.4	0.6	0.2	0.1	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RT830

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.0	21.1	43.8	61.4	70.6	75.1	77.0	77.0	77.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	79.2	81.5	83.0	83.5	83.4	82.8	82.0	81.0	80.0	78.8	77.6	76.1	74.6	72.8	70.8	68.8	66.5	63.9	60.9	57.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	54.3	50.4	46.3	42.0	37.5	32.9	28.3	24.0	20.0	16.3	12.9	7.6	4.1	2.1	1.0	0.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.553	1.542	1.536	1.532	1.530	1.529	1.527
P	0.910	0.913	0.915	0.915	0.916	0.916	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

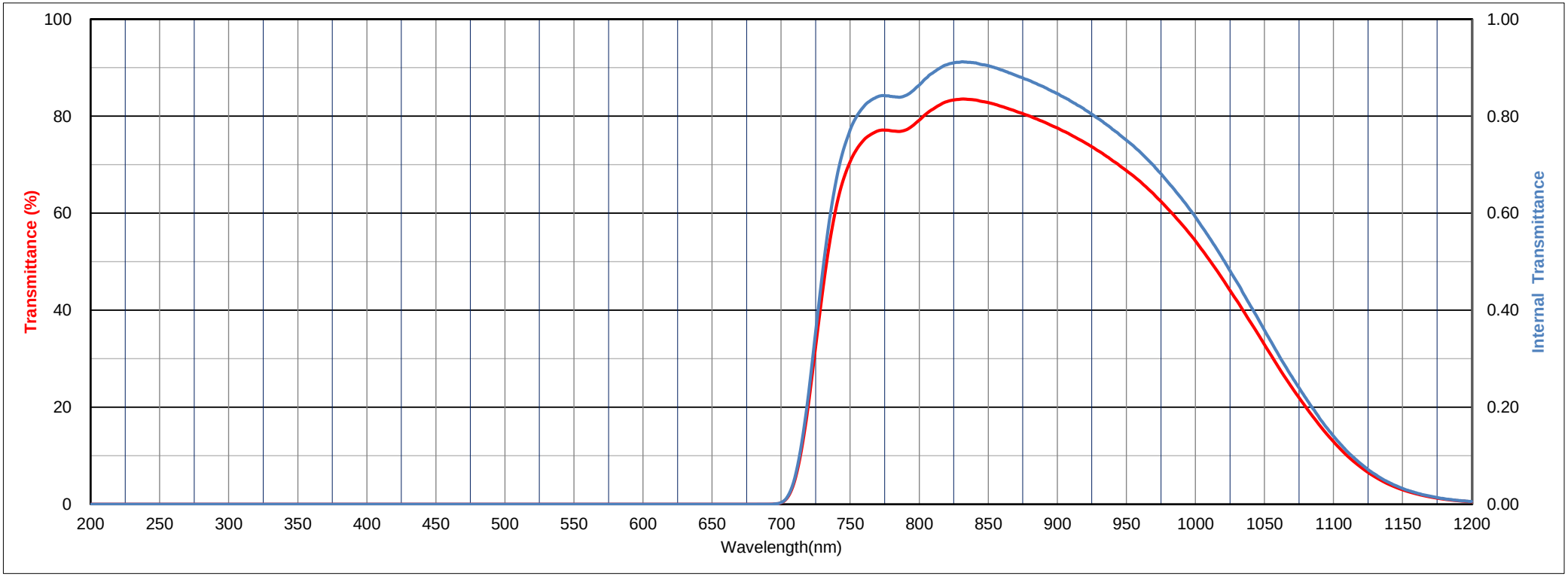
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	545	605	-	101	510	140	2.75

Tolerance of Transmittance (T)

Transmittance at 830nm	Transmittance at 700nm	Transmittance at 1200nm
T830(%)	T700(%)	T1200(%)
82±5	<5	<1



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HOYA

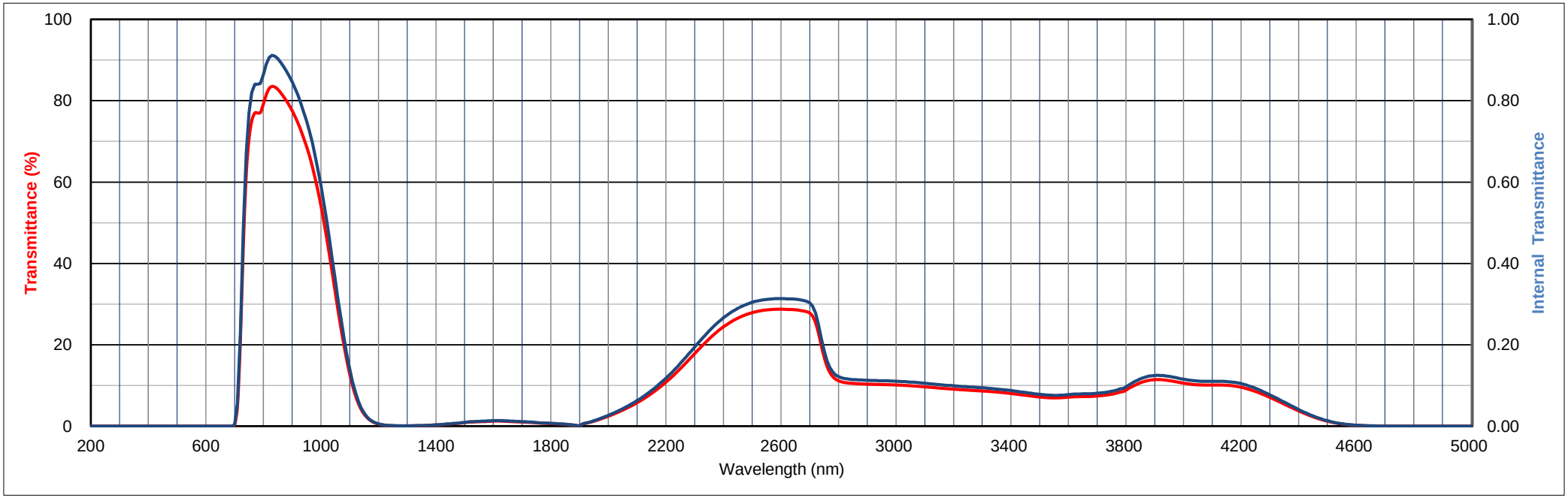
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

RT830

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.0	21.1	43.8	61.4	70.6	75.1	77.0	77.0	77.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	79.2	81.5	83.0	83.5	83.4	82.8	82.0	81.0	80.0	78.8	77.6	76.1	74.6	72.8	70.8	68.8	66.5	63.9	60.9	57.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	54.3	50.4	46.3	42.0	37.5	32.9	28.3	24.0	20.0	16.3	12.9	10.0	7.6	5.7	4.1	3.0	2.1	1.5	1.0	0.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.5	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	1.2	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.1	0.5	0.7	0.8	1.0	1.2	1.5	1.7	1.9	2.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	2.5	3.9	5.8	8.0	10.8	14.1	17.8	21.4	24.4	26.5	27.9	28.6	28.8	28.6	27.8	17.0	11.2	10.5	10.3	10.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	10.1	9.9	9.7	9.4	9.1	8.9	8.6	8.4	8.0	7.6	7.2	6.9	7.1	7.3	7.4	7.8	8.8	10.7	11.4	11.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	10.6	10.2	10.1	10.1	9.6	8.5	7.1	5.4	3.8	2.3	1.2	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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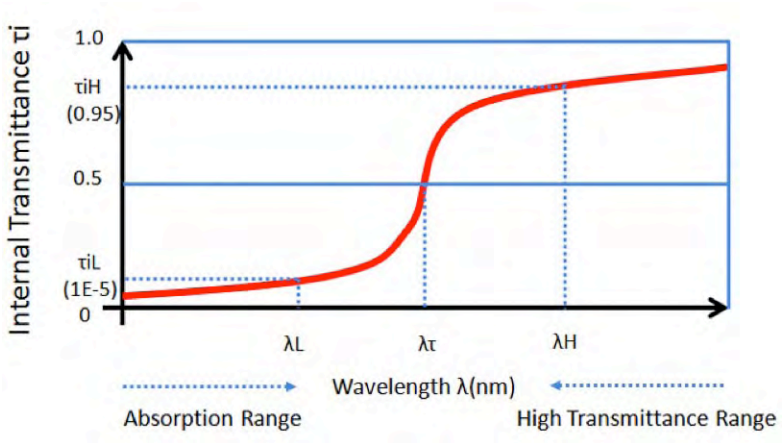
Sharp Cut Filters and Infrared Filters (W series)

Sharp cut filters include our new series (W series) whose transmission threshold wavelength is replaced with $\lambda\tau 0.5$ and that is predicated on the internal transmittance.

The conventional sharp cut filters have been compliant with domestic standards, and the W series is available to meet the needs of the world markets.

Newly specified specification values

Glass type	Specifications on the catalog (thickness: 3 mm)		
	Threshold wavelength	Absorption range	High transmittance range
	$\lambda\tau 0.5$	$\tau < 1\times10^{-5}$	Depending on glass type
W-L420	420±5 nm	>360 nm	>0.93 >530 nm
W-Y435	435±5 nm	>370 nm	>0.92 >520 nm
W-Y455	455±5 nm	>390 nm	>0.92 >530 nm
W-Y475	475±5 nm	>410 nm	>0.92 >550 nm
W-Y495	495±5 nm	>430 nm	>0.92 >560 nm
W-Y515	515±5 nm	>440 nm	>0.93 >580 nm
W-O530	530±5 nm	>460 nm	>0.93 >600 nm
W-O550	550±5 nm	>480 nm	>0.93 >620 nm
W-O570	570±5 nm	>500 nm	>0.93 >640 nm
W-O590	590±5 nm	>520 nm	>0.93 >660 nm
W-R610	610±5 nm	>540 nm	>0.94 >690 nm
W-R630	630±5 nm	>550 nm	>0.94 >710 nm
W-R645	645±5 nm	>560 nm	>0.94 >720 nm
W-R665	665±5 nm	>580 nm	>0.96 >750 nm
W-R695	695±5 nm	>610 nm	>0.96 >780 nm
W-R715	715±8 nm	>630 nm	>0.96 >810 nm
W-IR760	760±8 nm	>680 nm	>0.97 >880 nm
W-IR780	780±8 nm	>690 nm	>0.97 >900 nm
W-IR800	800±8 nm	>710 nm	>0.97 >920 nm
W-IR830	830±8 nm	>730 nm	>0.97 >950 nm
W-IR850	850±8 nm	>740 nm	>0.90 >950 nm



HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-L420

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	0.036	0.489	0.799	0.895	0.929	0.945	0.953	0.959	0.964	0.967	0.970	0.971	0.973	0.975	0.977	0.977	0.977	0.978	0.978
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.979	0.979	0.979	0.978	0.979	0.979	0.979	0.980	0.981	0.982	0.982	0.982	0.983	0.983	0.983	0.984	0.983	0.983	0.983	0.983
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.983	0.982	0.981	0.981	0.981	0.982	0.982	0.982	0.982	0.983	0.984	0.984	0.985	0.986	0.986	0.987	0.987	0.987	0.988	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.988	0.989	0.989	0.989	0.989	0.989	0.990	0.989	0.990	0.990	0.990	0.990	0.991	0.992	0.992	0.993				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.549	1.536	1.530	1.526	1.524	1.523	1.521
P	0.911	0.914	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

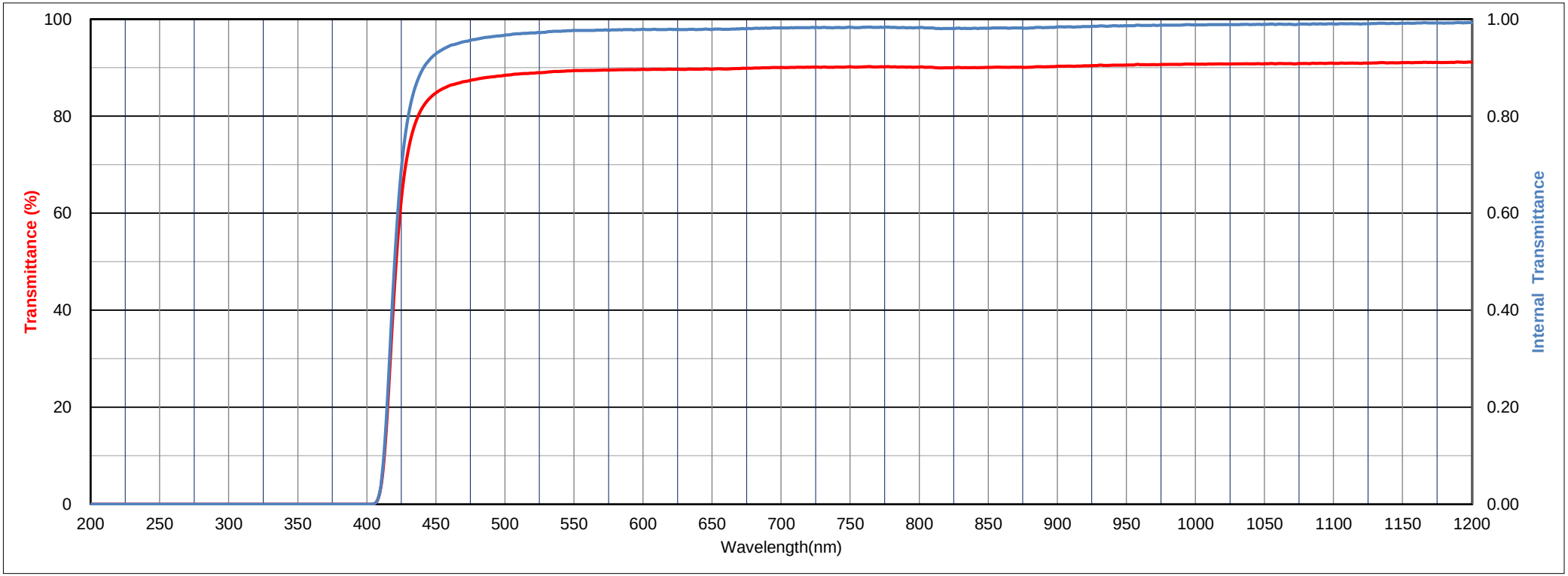
	x	y	Y	λ_d	P_e
A	0.452	0.413	89	580	7
C	0.317	0.330	89	569	6
D65	0.320	0.343	89	569	6

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	550	600	92	105	540	130	2.59

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
420±5	>360	>530



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HOYA

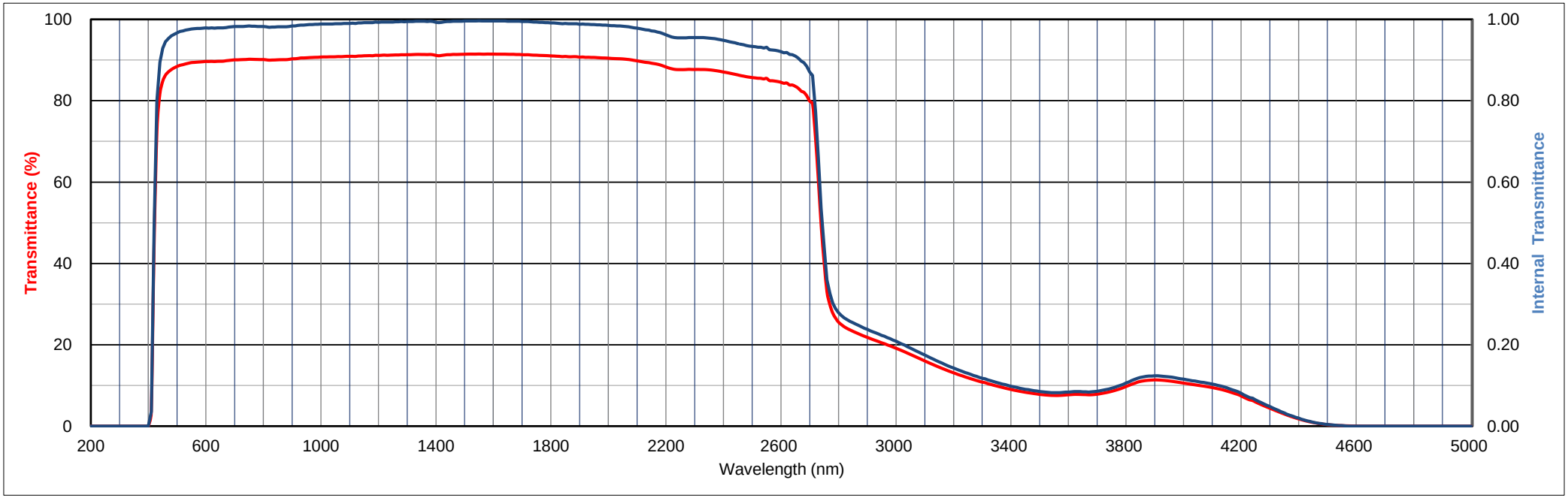
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-L420

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	0.036	0.489	0.799	0.895	0.929	0.945	0.953	0.959	0.964	0.967	0.970	0.971	0.973	0.975	0.977	0.977	0.977	0.978	0.978
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.979	0.979	0.979	0.978	0.979	0.979	0.979	0.980	0.981	0.982	0.982	0.982	0.983	0.983	0.983	0.984	0.983	0.983	0.983	0.983
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.983	0.982	0.981	0.981	0.981	0.982	0.982	0.982	0.982	0.983	0.984	0.984	0.985	0.986	0.986	0.987	0.987	0.987	0.988	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.988	0.989	0.989	0.989	0.989	0.989	0.990	0.989	0.990	0.990	0.990	0.990	0.990	0.991	0.991	0.992	0.992	0.992	0.992	0.993
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.993	0.993	0.994	0.993	0.993	0.994	0.994	0.994	0.995	0.994	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.993	0.994	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.995	0.994	0.993	0.993	0.993	0.993	0.992	0.992
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.991	0.991	0.991	0.990	0.989	0.990	0.989	0.989	0.989	0.989	0.988	0.988	0.988	0.988	0.987	0.987	0.987	0.986	0.986	0.986
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.985	0.983	0.978	0.972	0.962	0.955	0.955	0.954	0.948	0.940	0.933	0.931	0.921	0.910	0.870	0.440	0.279	0.254	0.238	0.223
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.209	0.192	0.175	0.158	0.143	0.130	0.118	0.108	0.098	0.091	0.085	0.082	0.084	0.085	0.086	0.093	0.106	0.120	0.124	0.121
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.115	0.109	0.103	0.094	0.081	0.065	0.048	0.033	0.019	0.010	0.004	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y435

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	0.005	0.231	0.678	0.854	0.905	0.925	0.938	0.949	0.957	0.964	0.970	0.974	0.979	0.982	0.984	0.985	0.986	0.987
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.988	0.988	0.988	0.988	0.989	0.988	0.988	0.988	0.988	0.989	0.988	0.988	0.987	0.988	0.987	0.986	0.986	0.986	0.985	0.984
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.984	0.983	0.981	0.981	0.981	0.981	0.982	0.980	0.980	0.981	0.981	0.982	0.982	0.983	0.984	0.984	0.984	0.984	0.984	0.984
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.984	0.985	0.985	0.985	0.985	0.985	0.986	0.985	0.985	0.986	0.986	0.986	0.986	0.987	0.987	0.988				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.541	1.534	1.531	1.529	1.527	1.526	1.526
P	0.913	0.915	0.916	0.916	0.917	0.917	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

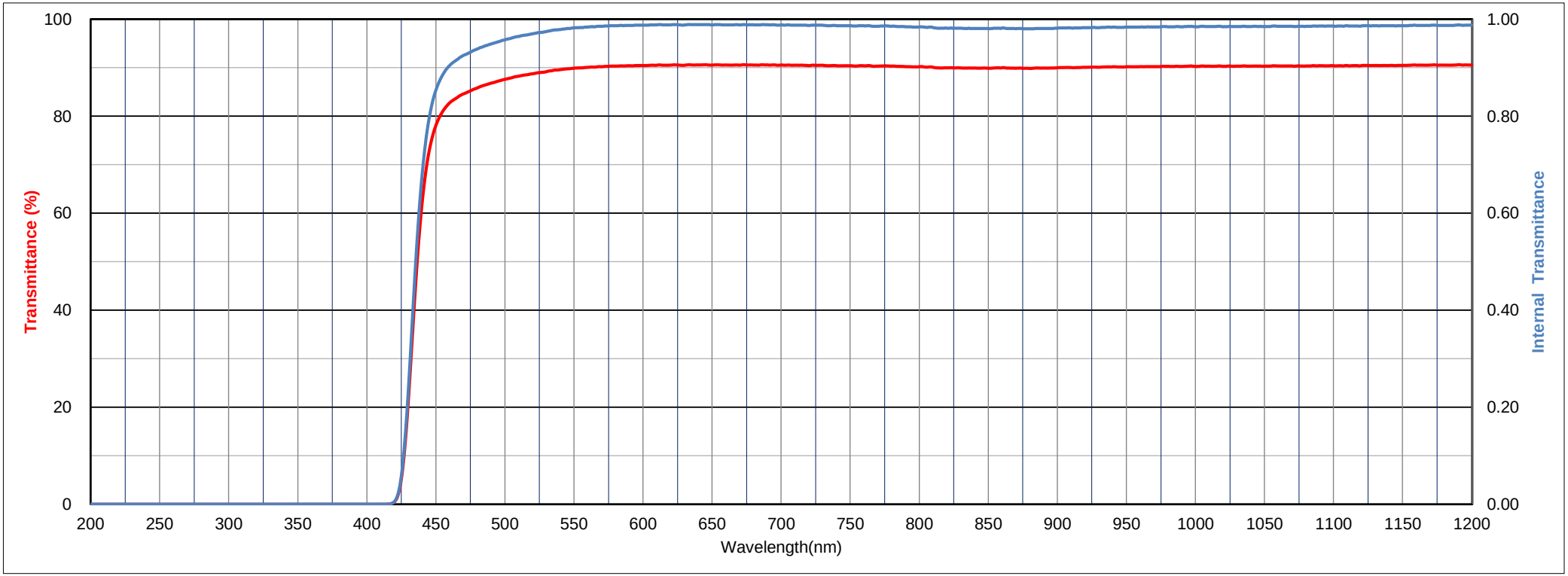
	x	y	Y	λ_d	P_e
A	0.460	0.421	90	580	18
C	0.331	0.357	89	569	17
D65	0.333	0.368	89	569	16

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	570	600	99	107	540	130	2.59

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
435±5	>370	>520



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HOYA

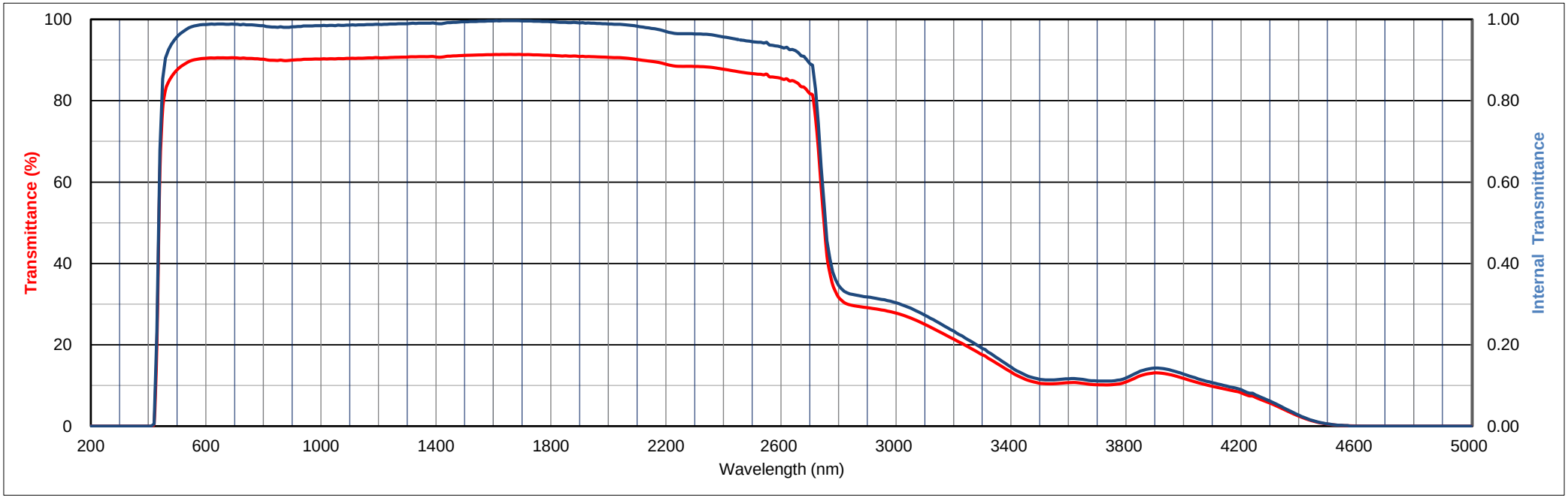
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y435

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	0.005	0.231	0.678	0.854	0.905	0.925	0.938	0.949	0.957	0.964	0.970	0.974	0.979	0.982	0.984	0.985	0.986	0.987
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.988	0.988	0.988	0.988	0.989	0.988	0.988	0.988	0.988	0.989	0.988	0.988	0.987	0.988	0.987	0.986	0.986	0.986	0.985	0.984
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.984	0.983	0.981	0.981	0.981	0.981	0.982	0.980	0.980	0.981	0.981	0.982	0.982	0.983	0.984	0.984	0.984	0.984	0.984	0.984
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.984	0.985	0.985	0.985	0.985	0.985	0.986	0.985	0.985	0.986	0.986	0.986	0.986	0.987	0.986	0.987	0.987	0.987	0.987	0.988
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.988	0.987	0.988	0.988	0.988	0.989	0.989	0.989	0.989	0.989	0.989	0.990	0.990	0.990	0.991	0.991	0.991	0.991	0.991	0.991
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.990	0.989	0.989	0.991	0.992	0.992	0.993	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.997	0.996	0.997	0.997	0.996	0.996	0.997	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995	0.995	0.995
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.994	0.994	0.993	0.993	0.992	0.993	0.992	0.992	0.993	0.992	0.991	0.992	0.991	0.991	0.991	0.990	0.990	0.990	0.990	0.989
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.989	0.987	0.983	0.978	0.970	0.965	0.964	0.963	0.957	0.951	0.945	0.944	0.932	0.923	0.892	0.544	0.346	0.323	0.318	0.312
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.303	0.290	0.273	0.254	0.234	0.213	0.191	0.169	0.145	0.126	0.115	0.114	0.117	0.115	0.111	0.111	0.119	0.135	0.143	0.139
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.128	0.117	0.107	0.099	0.089	0.077	0.062	0.044	0.027	0.014	0.006	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y455

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	0.006	0.261	0.708	0.888	0.942	0.960	0.967	0.971	0.974	0.975	0.977	0.978	0.978	0.980	0.981	0.981
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.982	0.983	0.983	0.983	0.984	0.985	0.985	0.986	0.984	0.985	0.986	0.986	0.988	0.988	0.987	0.988	0.988	0.989	0.989
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.988	0.988	0.989	0.989	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.989	0.988	0.989
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.989	0.990	0.990	0.989	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.991	0.991	0.991	0.991	0.993				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.543	1.533	1.528	1.525	1.523	1.522	1.521
P	0.913	0.915	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

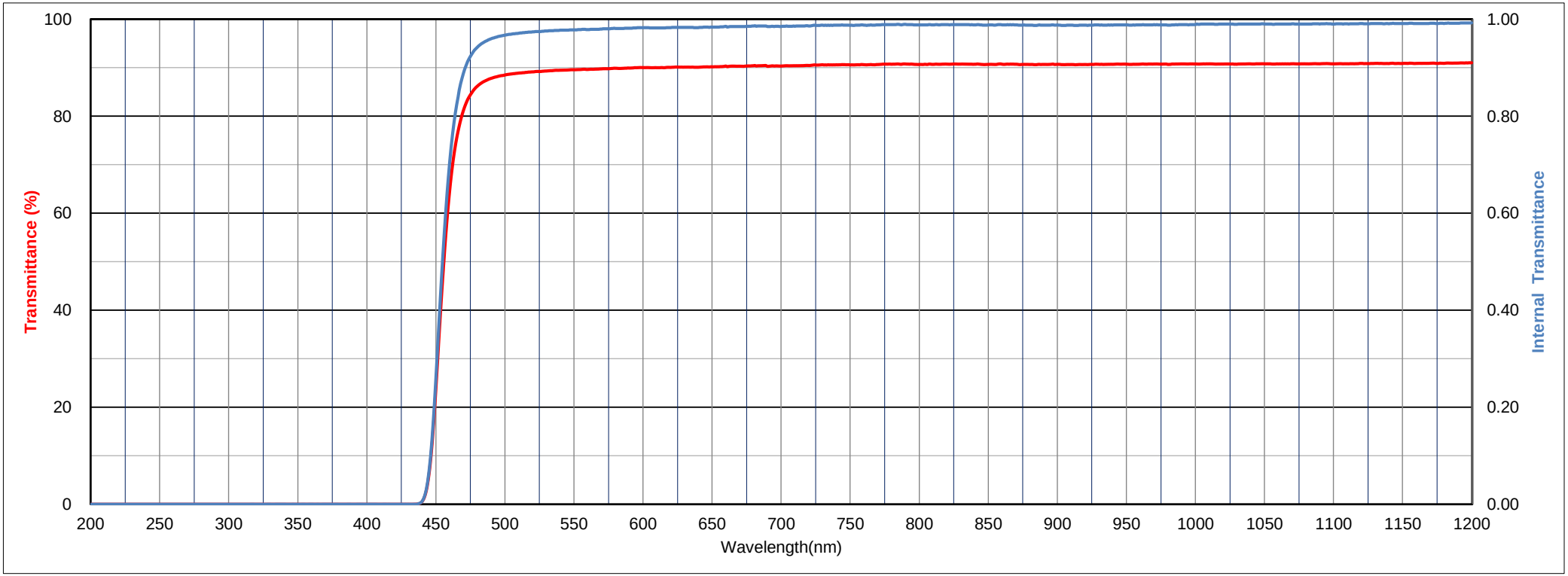
	x	y	Y	λ_d	P_e
A	0.473	0.440	89	580	40
C	0.360	0.416	89	569	40
D65	0.359	0.424	89	568	40

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	560	625	94	105	540	130	2.67

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
455±5	>390	>530



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HOYA

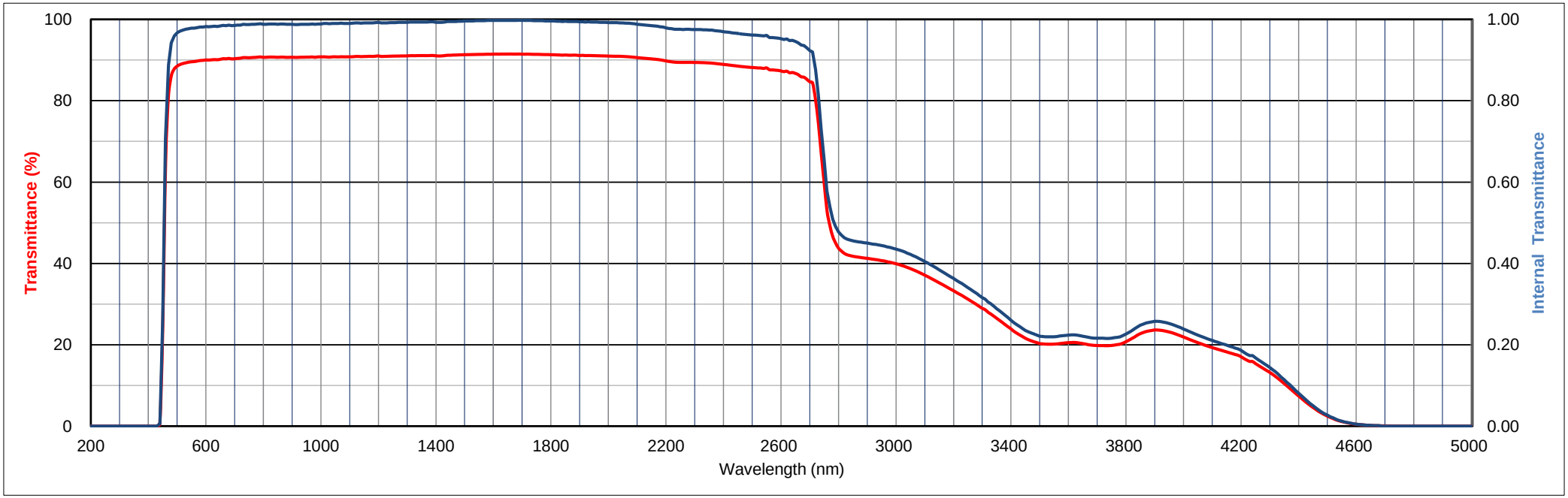
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y455

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	0.006	0.261	0.708	0.888	0.942	0.960	0.967	0.971	0.974	0.975	0.977	0.978	0.978	0.980	0.981	0.981
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.982	0.983	0.983	0.983	0.984	0.985	0.985	0.986	0.984	0.985	0.986	0.986	0.988	0.988	0.987	0.988	0.988	0.989	0.989
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.988	0.988	0.989	0.989	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.988	0.989	0.988	0.989
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.989	0.990	0.990	0.989	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.991	0.991	0.991	0.991	0.991	0.992	0.991	0.992
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.993	0.991	0.992	0.992	0.992	0.992	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.993	0.994	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.993	0.993	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.997
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.997	0.998	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.996	0.996	0.996
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.996	0.996	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994	0.994	0.993	0.993	0.993	0.993	0.993
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.992	0.991	0.988	0.985	0.979	0.975	0.975	0.974	0.970	0.965	0.962	0.961	0.952	0.946	0.923	0.655	0.477	0.456	0.450	0.444
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.435	0.422	0.405	0.384	0.363	0.341	0.316	0.289	0.261	0.236	0.221	0.220	0.224	0.221	0.216	0.216	0.226	0.248	0.258	0.252
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.239	0.224	0.211	0.199	0.186	0.168	0.144	0.114	0.081	0.050	0.027	0.012	0.005	0.002	0.001	0.001	0.001	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y475

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.018	0.281	0.672	0.865	0.934	0.960	0.970	0.975	0.978	0.980	0.980	0.981	0.982	0.982
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.982	0.983	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.986	0.986	0.987	0.987	0.987	0.987	0.987	0.987	0.987	0.986
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.987	0.985	0.985	0.985	0.985	0.985	0.986	0.985	0.986	0.986	0.988	0.988	0.989	0.990	0.990	0.991	0.991	0.991	0.992	0.993
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.992	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.996				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.548	1.536	1.530	1.527	1.525	1.523	1.522
P	0.912	0.915	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

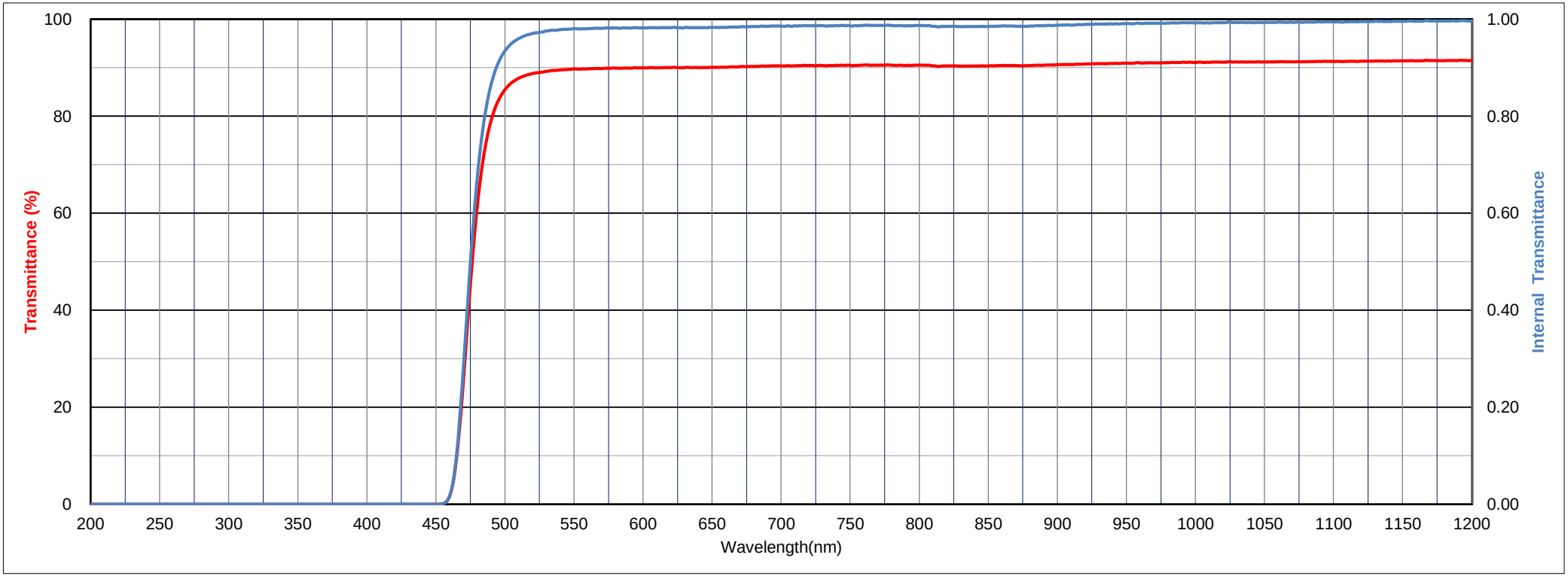
	x	y	Y	λ_d	P_e
A	0.493	0.462	89	580	69
C	0.405	0.487	87	570	71
D65	0.402	0.493	87	569	71

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	560	625	94	105	540	130	2.67

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
475±5	>410	>550



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HOYA

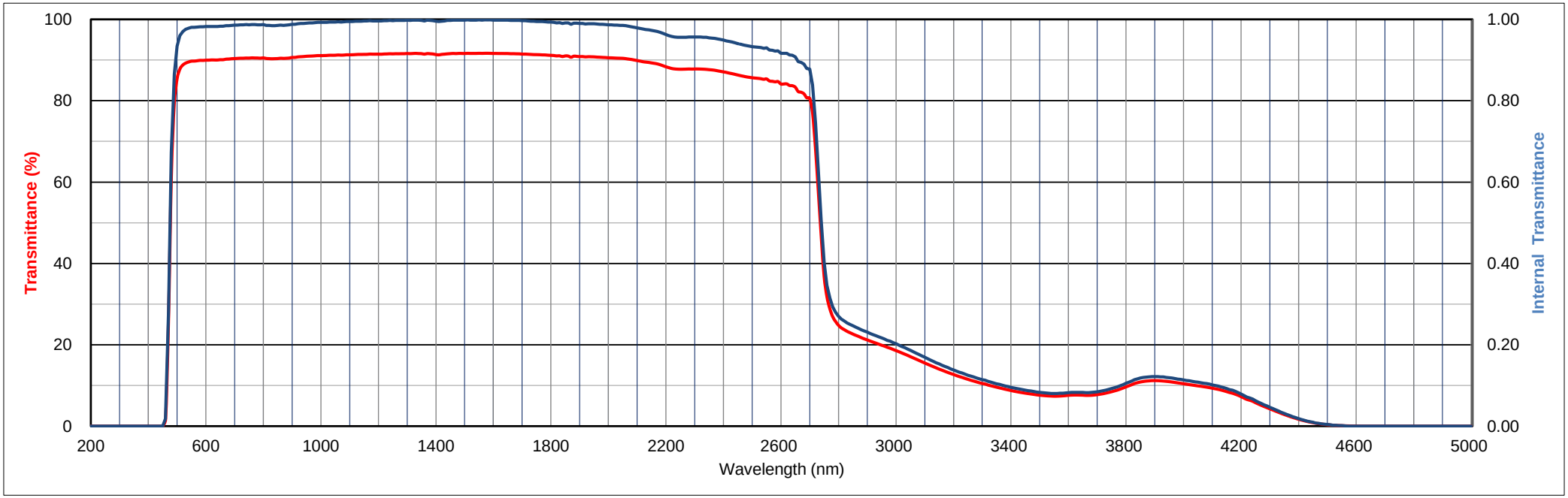
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y475

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.018	0.281	0.672	0.865	0.934	0.960	0.970	0.975	0.978	0.980	0.980	0.981	0.982	0.982
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.982	0.983	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.986	0.986	0.987	0.987	0.987	0.987	0.987	0.987	0.987	0.986
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.987	0.985	0.985	0.985	0.985	0.985	0.986	0.985	0.986	0.986	0.988	0.988	0.989	0.990	0.990	0.991	0.991	0.991	0.992	0.993
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.992	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.996	0.998	0.997	0.997
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.995	0.994	0.996	0.996	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.998	0.998	0.998	0.999	0.998	0.999	0.999	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.997	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.994	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.993	0.992	0.992	0.990	0.992	0.991	0.988	0.991	0.990	0.990	0.990	0.989	0.989	0.989	0.989	0.988	0.988	0.988	0.987
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.987	0.985	0.979	0.973	0.962	0.956	0.957	0.955	0.949	0.940	0.933	0.930	0.916	0.908	0.878	0.402	0.270	0.247	0.231	0.217
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.202	0.186	0.169	0.153	0.138	0.125	0.114	0.104	0.095	0.088	0.083	0.080	0.083	0.083	0.084	0.092	0.105	0.118	0.122	0.119
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.114	0.108	0.102	0.092	0.079	0.063	0.046	0.031	0.018	0.009	0.004	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y495

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.004	0.251	0.720	0.900	0.951	0.968	0.975	0.978	0.980	0.980	0.981	0.981
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.981	0.982	0.982	0.982	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.985	0.986	0.985	0.986	0.985	0.985	0.985	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.985	0.984	0.983	0.983	0.983	0.984	0.984	0.984	0.984	0.985	0.986	0.987	0.987	0.988	0.988	0.989	0.990	0.990	0.990	0.991
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.991	0.992	0.991	0.992	0.992	0.992	0.993	0.992	0.992	0.993	0.993	0.993	0.994	0.994	0.994	0.995				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.548	1.537	1.530	1.527	1.525	1.523	1.522
P	0.912	0.914	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

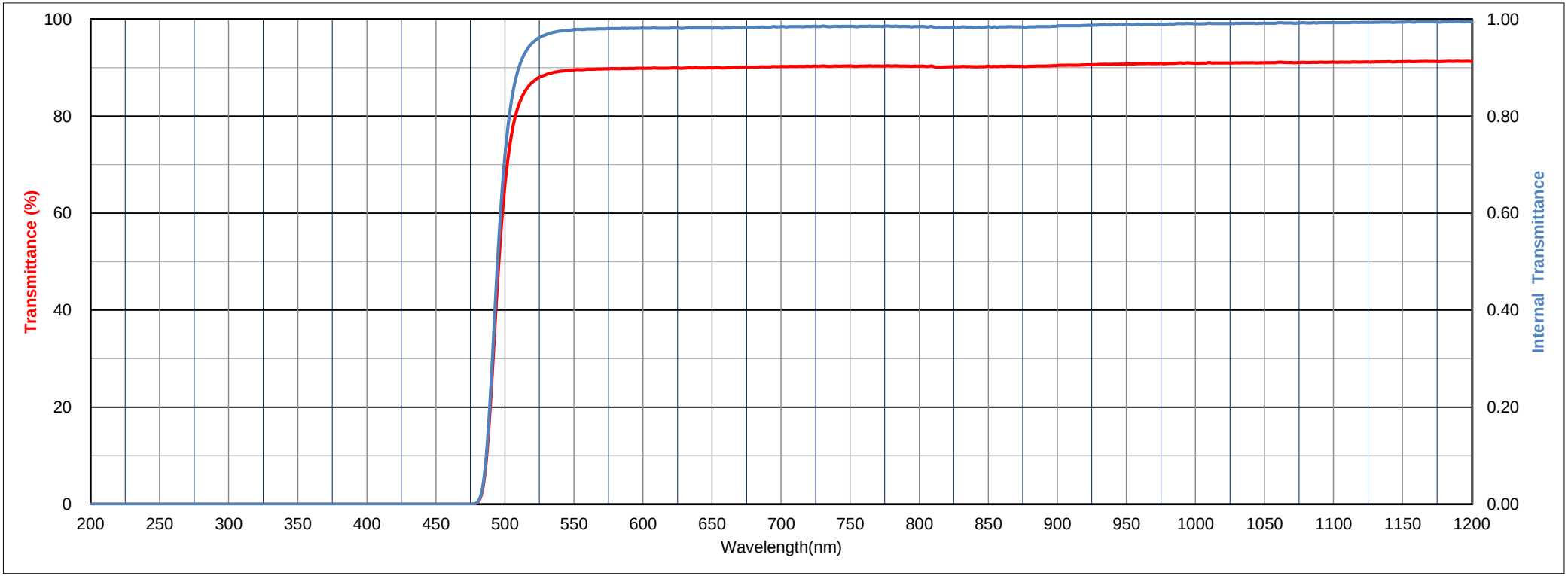
	x	y	Y	λ_d	P_e
A	0.510	0.472	87	581	88
C	0.443	0.521	83	572	91
D65	0.438	0.526	83	571	90

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	560	625	94	105	540	130	2.67

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
495±5	>430	>560



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HOYA

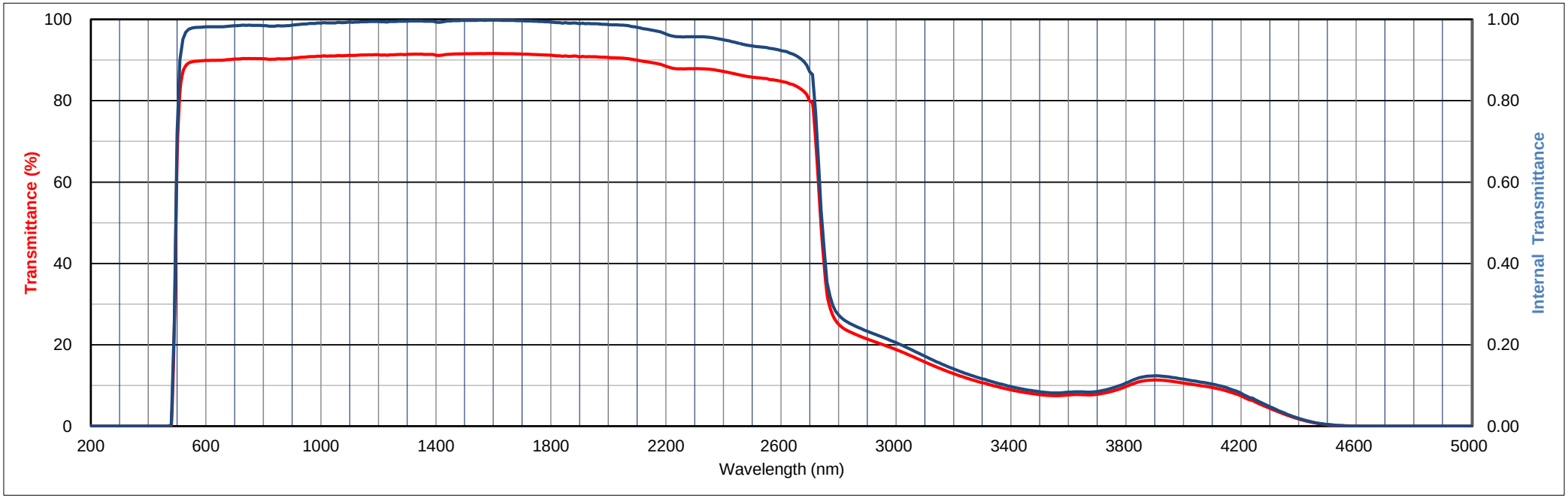
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-Y495

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.004	0.251	0.720	0.900	0.951	0.968	0.975	0.978	0.980	0.980	0.981	0.981
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.982	0.981	0.982	0.982	0.982	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.985	0.986	0.985	0.986	0.985	0.985	0.985	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.985	0.984	0.983	0.983	0.983	0.984	0.984	0.984	0.984	0.985	0.986	0.987	0.987	0.988	0.988	0.989	0.990	0.990	0.990	0.991
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.991	0.992	0.991	0.992	0.992	0.992	0.993	0.992	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.995	0.994	0.995
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.995	0.994	0.994	0.994	0.994	0.994	0.995	0.995	0.996	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.993	0.994	0.995	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.998	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.998	0.998	0.998	0.998	0.997	0.998	0.997	0.997	0.997	0.997	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.994	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.993	0.992	0.992	0.991	0.992	0.991	0.991	0.991	0.991	0.989	0.990	0.989	0.990	0.989	0.989	0.989	0.988	0.988	0.988
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.987	0.986	0.980	0.974	0.964	0.957	0.957	0.956	0.950	0.942	0.935	0.931	0.924	0.912	0.871	0.434	0.273	0.249	0.233	0.219
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.205	0.189	0.172	0.156	0.141	0.128	0.116	0.106	0.097	0.090	0.084	0.082	0.083	0.084	0.085	0.093	0.106	0.120	0.124	0.121
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.115	0.110	0.103	0.094	0.081	0.065	0.048	0.032	0.019	0.010	0.004	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-Y515

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.004	0.234	0.704	0.894	0.949	0.967	0.973	0.976	0.977	0.978
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.978	0.978	0.979	0.978	0.979	0.979	0.979	0.980	0.980	0.981	0.981	0.981	0.982	0.982	0.982	0.982	0.982	0.982	0.982	0.982
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.982	0.981	0.979	0.980	0.980	0.980	0.980	0.981	0.981	0.981	0.982	0.983	0.984	0.985	0.985	0.986	0.987	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.988	0.988	0.988	0.989	0.989	0.989	0.990	0.990	0.990	0.990	0.990	0.991	0.992	0.992	0.992	0.993				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.543	1.534	1.529	1.526	1.524	1.523	1.522
P	0.913	0.915	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

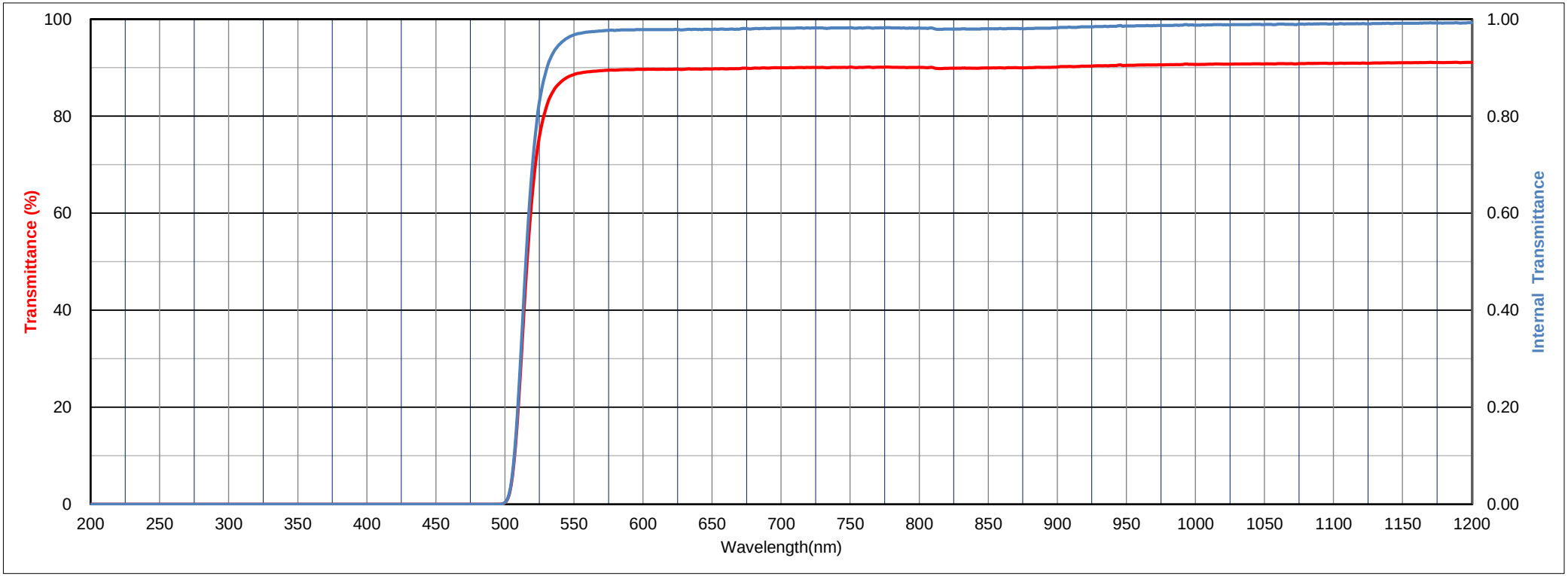
	x	y	Y	λ_d	P_e
A	0.530	0.464	82	583	96
C	0.478	0.512	75	576	98
D65	0.473	0.516	75	575	97

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	560	620	96	108	540	130	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
515±5	>440	>580



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

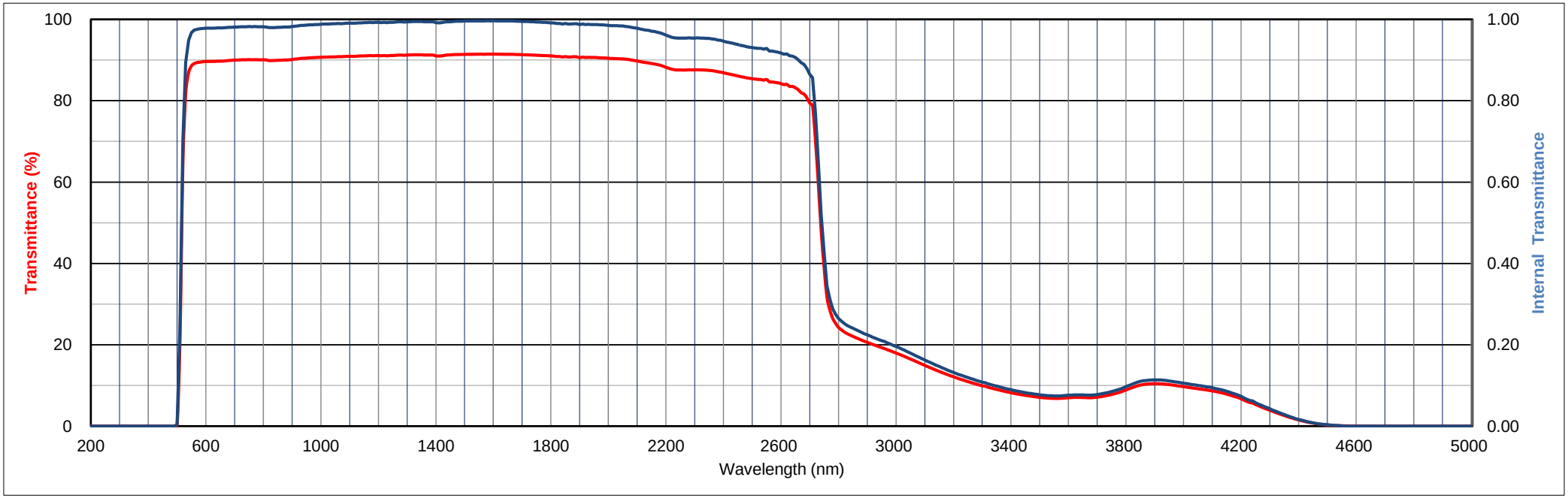
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-Y515

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.004	0.234	0.704	0.894	0.949	0.967	0.973	0.976	0.977	0.978
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.978	0.978	0.979	0.978	0.979	0.979	0.979	0.980	0.980	0.981	0.981	0.981	0.982	0.982	0.982	0.982	0.982	0.982	0.982	0.982
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.982	0.981	0.979	0.980	0.980	0.980	0.980	0.981	0.981	0.981	0.982	0.983	0.984	0.985	0.985	0.986	0.987	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.988	0.988	0.988	0.989	0.989	0.989	0.990	0.990	0.990	0.990	0.990	0.991	0.991	0.991	0.992	0.992	0.992	0.993	0.992	0.992
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.993	0.992	0.993	0.992	0.993	0.993	0.993	0.994	0.994	0.993	0.994	0.994	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.992	0.991	0.992	0.993	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995	0.995	0.994	0.994	0.993	0.993	0.993	0.992	0.992
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.992	0.991	0.990	0.990	0.989	0.990	0.989	0.989	0.990	0.989	0.987	0.988	0.987	0.988	0.987	0.988	0.987	0.987	0.986	0.986
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.985	0.984	0.978	0.971	0.961	0.954	0.954	0.953	0.947	0.938	0.931	0.928	0.918	0.906	0.865	0.426	0.265	0.240	0.225	0.210
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.196	0.180	0.163	0.147	0.132	0.119	0.108	0.098	0.090	0.082	0.077	0.074	0.076	0.077	0.078	0.085	0.097	0.110	0.114	0.111
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.106	0.100	0.094	0.086	0.073	0.058	0.043	0.028	0.017	0.008	0.003	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O530

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.007	0.134	0.484	0.772	0.901	0.950	0.968	0.976	0.980
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.981	0.982	0.983	0.983	0.983	0.983	0.984	0.984	0.985	0.985	0.986	0.986	0.986	0.987	0.986	0.986	0.986	0.986	0.986	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.986	0.986	0.984	0.984	0.984	0.985	0.985	0.985	0.985	0.986	0.987	0.987	0.988	0.989	0.989	0.990	0.990	0.991	0.991	0.992
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.992	0.993	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.994	0.995	0.995	0.996	0.996	0.996				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.545	1.535	1.529	1.525	1.523	1.522	1.521
P	0.912	0.915	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

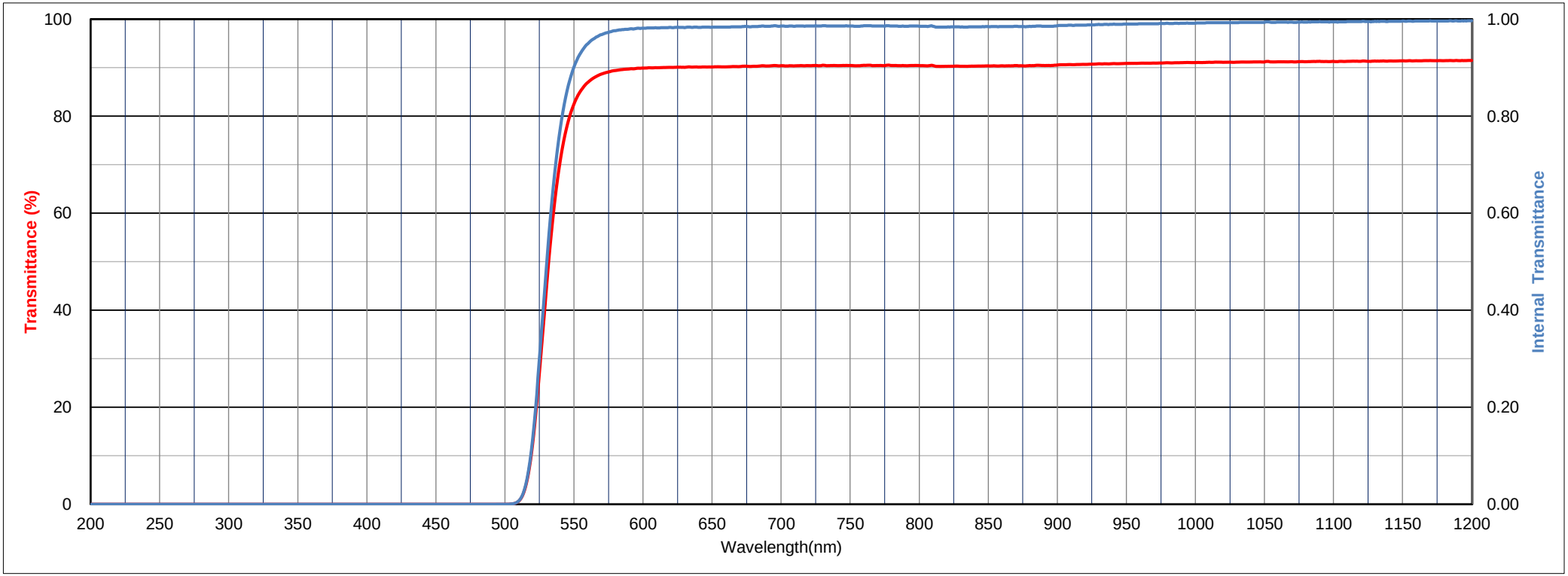
	x	y	Y	λ_d	P_e
A	0.552	0.445	74	586	99
C	0.509	0.487	65	580	99
D65	0.507	0.489	64	579	99

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	99	107	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
530±5	>460	>600



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HOYA

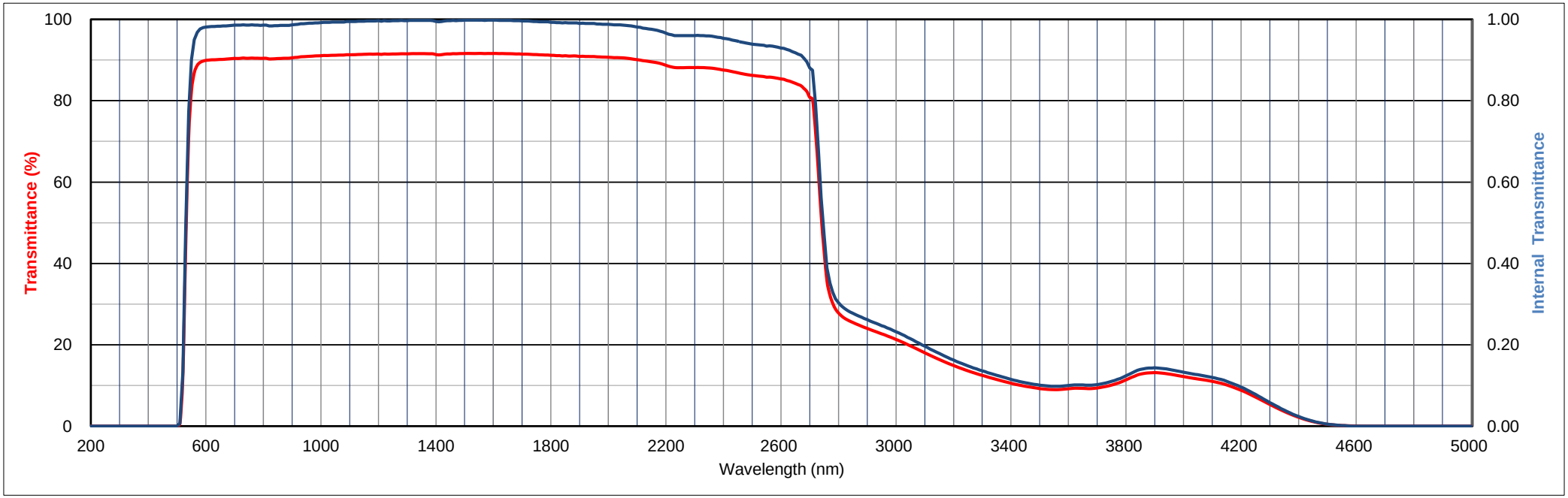
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O530

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.007	0.134	0.484	0.772	0.901	0.950	0.968	0.976	0.980
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.981	0.982	0.983	0.983	0.983	0.983	0.984	0.984	0.985	0.985	0.986	0.986	0.986	0.987	0.986	0.986	0.986	0.986	0.986	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.986	0.986	0.984	0.984	0.984	0.985	0.985	0.985	0.985	0.986	0.987	0.987	0.988	0.989	0.989	0.990	0.990	0.991	0.991	0.992
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.992	0.993	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.994	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.996	0.995	0.997	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.998	0.997	0.998	0.997	0.997	0.997	0.997	0.997
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.995	0.994	0.995	0.996	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.994	0.994	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.993	0.992	0.992	0.991	0.992	0.991	0.991	0.991	0.991	0.990	0.990	0.990	0.990	0.990	0.990	0.989	0.989	0.988	0.988
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.988	0.986	0.981	0.975	0.966	0.960	0.960	0.959	0.954	0.946	0.939	0.934	0.930	0.918	0.880	0.469	0.303	0.278	0.262	0.247
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.232	0.215	0.197	0.179	0.163	0.148	0.136	0.125	0.115	0.107	0.100	0.098	0.100	0.101	0.102	0.110	0.124	0.139	0.143	0.139
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.133	0.126	0.120	0.110	0.096	0.078	0.058	0.039	0.024	0.012	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O550

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.003	0.111	0.477	0.775	0.903	0.951	0.970
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.977	0.981	0.982	0.983	0.983	0.984	0.983	0.984	0.985	0.985	0.985	0.986	0.986	0.986	0.986	0.987	0.986	0.986	0.986	0.986
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.986	0.985	0.984	0.984	0.984	0.984	0.985	0.984	0.984	0.985	0.986	0.987	0.988	0.989	0.989	0.989	0.990	0.990	0.991	0.991
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.992	0.992	0.992	0.993	0.992	0.993	0.993	0.994	0.993	0.994	0.994	0.994	0.995	0.996	0.996	0.996				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.546	1.535	1.528	1.525	1.522	1.521	1.519
P	0.912	0.915	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

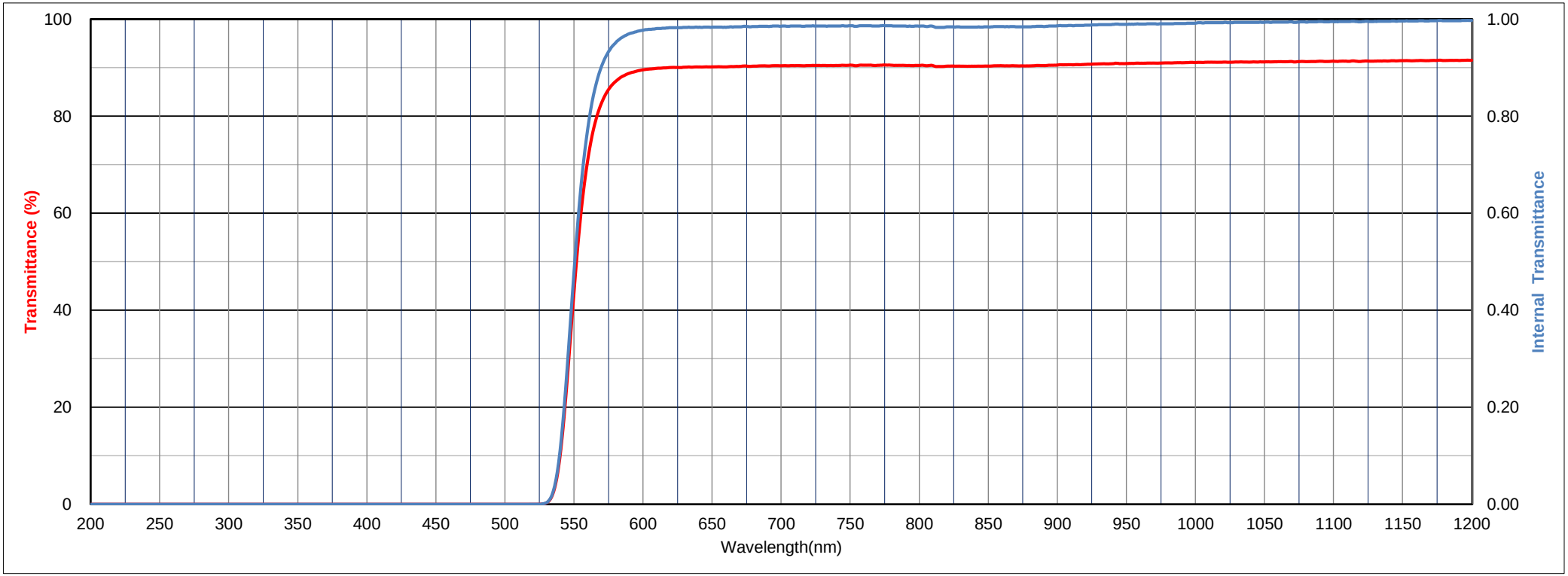
	x	y	Y	λ_d	P_e
A	0.589	0.410	61	592	100
C	0.559	0.440	49	587	100
D65	0.559	0.439	48	587	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	93	104	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
550±5	>480	>620



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HOYA

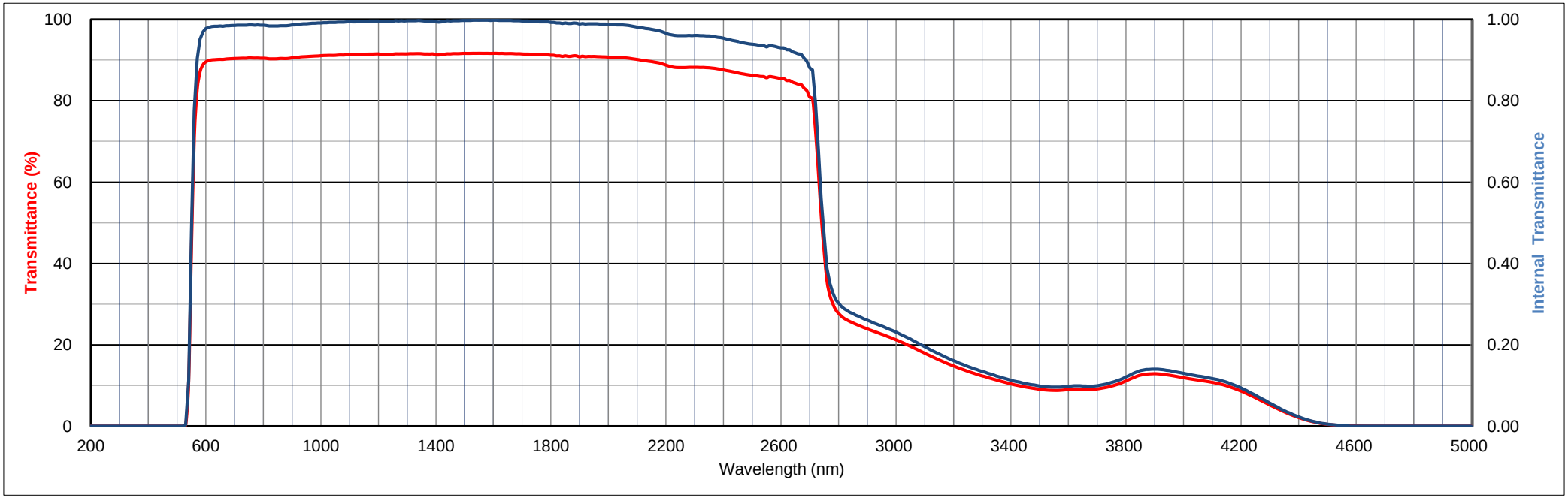
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O550

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.003	0.111	0.477	0.775	0.903	0.951	0.970
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.977	0.981	0.982	0.983	0.983	0.984	0.983	0.984	0.985	0.985	0.985	0.986	0.986	0.986	0.986	0.987	0.986	0.986	0.986	0.986
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.986	0.985	0.984	0.984	0.984	0.984	0.985	0.984	0.984	0.985	0.986	0.987	0.988	0.989	0.989	0.989	0.990	0.990	0.991	0.991
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.992	0.992	0.992	0.993	0.992	0.993	0.993	0.994	0.993	0.994	0.994	0.994	0.994	0.995	0.995	0.996	0.996	0.996	0.996	0.996
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.996	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.997	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.996	0.996	0.996	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.994	0.994	0.995	0.997	0.996	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.997	0.997	0.997	0.996	0.996	0.996	0.996	0.995	0.995	0.994	0.994	0.994	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.993	0.991	0.991	0.990	0.991	0.990	0.990	0.992	0.991	0.988	0.990	0.989	0.990	0.989	0.990	0.989	0.989	0.988	0.988
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.988	0.986	0.981	0.976	0.966	0.960	0.960	0.959	0.954	0.946	0.939	0.932	0.930	0.918	0.880	0.468	0.302	0.276	0.261	0.246
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.231	0.214	0.195	0.177	0.161	0.147	0.134	0.123	0.113	0.105	0.098	0.096	0.098	0.099	0.100	0.107	0.121	0.136	0.140	0.137
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.130	0.123	0.117	0.108	0.094	0.076	0.057	0.038	0.023	0.012	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O570

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.003	0.104	0.485	0.794	0.917
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.958	0.973	0.979	0.981	0.983	0.983	0.983	0.984	0.985	0.985	0.985	0.986	0.985	0.986	0.986	0.986	0.986	0.986	0.986	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.985	0.984	0.983	0.983	0.984	0.984	0.985	0.984	0.984	0.985	0.985	0.986	0.987	0.988	0.989	0.989	0.989	0.990	0.990	0.990
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.991	0.991	0.991	0.992	0.992	0.992	0.992	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.995				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.545	1.535	1.529	1.525	1.523	1.522	1.521
P	0.912	0.915	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

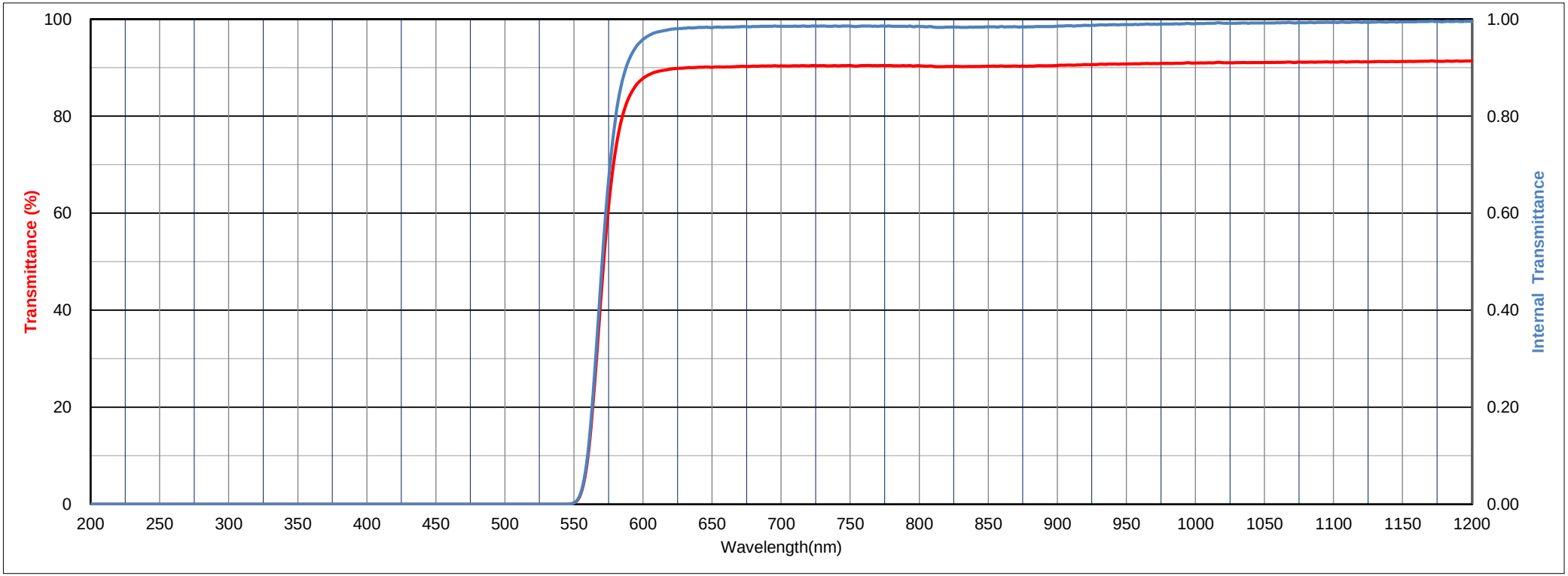
	x	y	Y	λ_d	P_e
A	0.630	0.370	45	601	100
C	0.614	0.386	33	597	100
D65	0.614	0.386	32	597	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	93	104	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
570±5	>500	>640



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HOYA

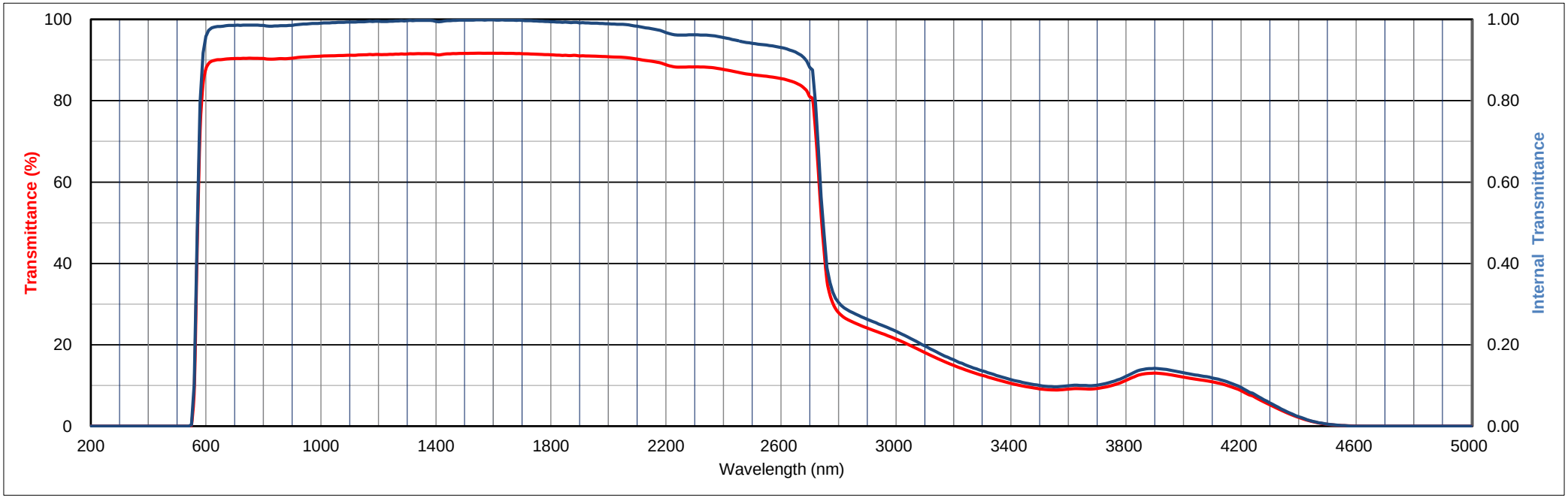
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O570

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.003	0.104	0.485	0.794	0.917
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.958	0.973	0.979	0.981	0.983	0.983	0.983	0.984	0.985	0.985	0.985	0.986	0.985	0.986	0.986	0.986	0.986	0.986	0.986	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.985	0.984	0.983	0.983	0.984	0.984	0.985	0.984	0.984	0.985	0.985	0.986	0.987	0.988	0.989	0.989	0.989	0.990	0.990	0.990
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.991	0.991	0.991	0.992	0.992	0.992	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.995	0.995	0.995
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.995	0.995	0.995	0.995	0.996	0.995	0.996	0.996	0.997	0.996	0.997	0.997	0.997	0.997	0.998	0.997	0.997	0.997	0.997	0.997
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.995	0.994	0.995	0.996	0.997	0.997	0.998	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.999	0.998	0.998	0.999	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.999	0.998	0.998	0.999	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.996	0.995	0.995	0.995
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.994	0.994	0.993	0.993	0.993	0.993	0.992	0.992	0.993	0.992	0.991	0.992	0.991	0.991	0.991	0.991	0.991	0.990	0.990	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.989	0.988	0.983	0.977	0.968	0.961	0.962	0.961	0.955	0.948	0.941	0.937	0.931	0.920	0.882	0.469	0.304	0.279	0.263	0.248
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.233	0.216	0.197	0.179	0.163	0.148	0.136	0.125	0.115	0.106	0.100	0.097	0.099	0.100	0.101	0.109	0.123	0.138	0.142	0.138
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.131	0.125	0.119	0.109	0.095	0.077	0.057	0.039	0.023	0.012	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O590

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.002	0.100	0.512
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.822	0.931	0.964	0.975	0.980	0.982	0.983	0.984	0.984	0.985	0.985	0.985	0.986	0.986	0.985	0.985	0.985	0.985	0.984	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.984	0.984	0.983	0.983	0.983	0.983	0.984	0.983	0.983	0.984	0.985	0.986	0.986	0.987	0.987	0.988	0.989	0.989	0.989	0.990
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.990	0.991	0.990	0.991	0.991	0.991	0.991	0.992	0.992	0.992	0.993	0.992	0.994	0.994	0.994	0.994				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.546	1.536	1.530	1.526	1.524	1.523	1.521
P	0.912	0.915	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

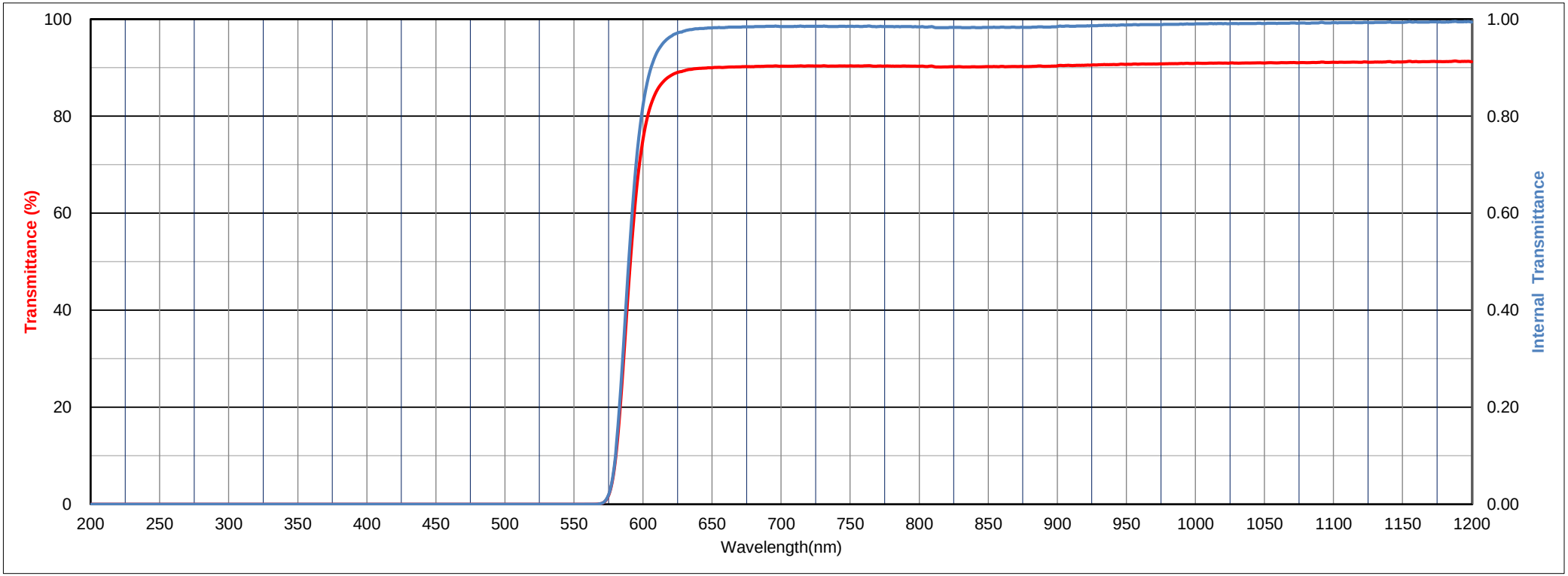
	x	y	Y	λ_d	P_e
A	0.670	0.330	29	611	100
C	0.663	0.337	19	609	100
D65	0.663	0.337	19	609	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	625	93	104	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
590±5	>520	>660



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HOYA

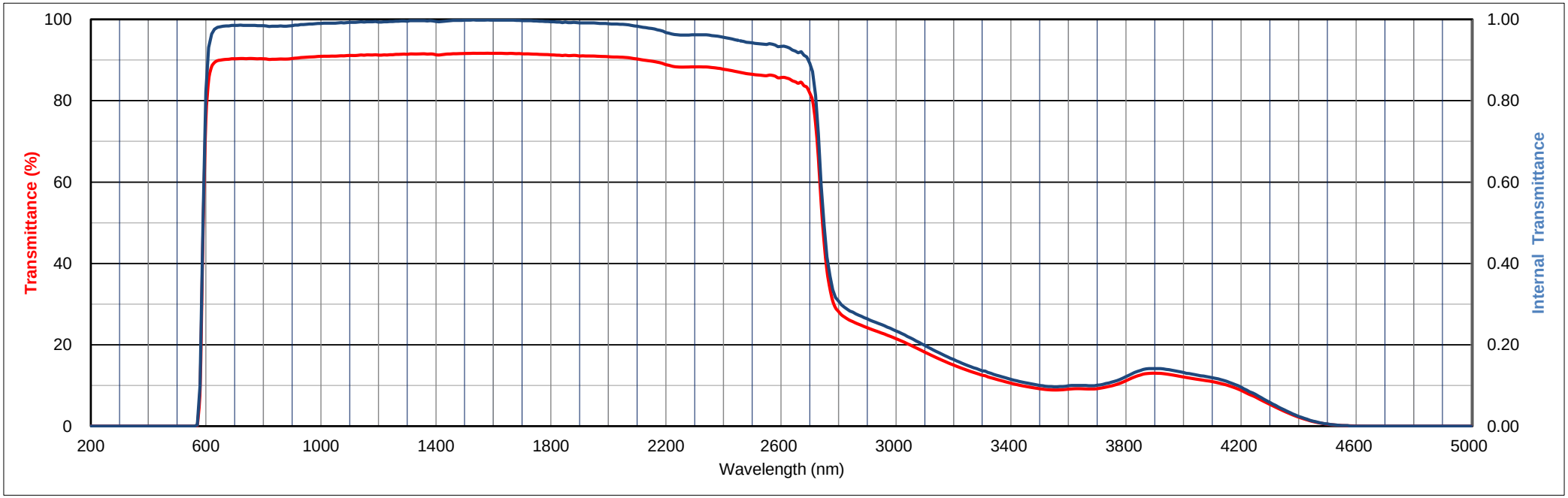
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-O590

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.002	0.100	0.512
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.822	0.931	0.964	0.975	0.980	0.982	0.983	0.984	0.984	0.985	0.985	0.985	0.986	0.986	0.985	0.985	0.985	0.985	0.984	0.985
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.984	0.984	0.983	0.983	0.983	0.983	0.984	0.983	0.983	0.984	0.985	0.986	0.986	0.987	0.987	0.988	0.989	0.989	0.989	0.990
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.990	0.991	0.990	0.991	0.991	0.991	0.991	0.992	0.992	0.992	0.993	0.992	0.992	0.993	0.994	0.993	0.994	0.994	0.994	0.994
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.994	0.993	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.997	0.997	0.996	0.997	0.997	0.997	0.996	0.997	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.994	0.995	0.996	0.996	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.998
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.995
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.994	0.994	0.993	0.993	0.992	0.993	0.992	0.992	0.993	0.992	0.991	0.992	0.991	0.991	0.991	0.991	0.991	0.990	0.990	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.989	0.988	0.983	0.977	0.968	0.961	0.962	0.961	0.956	0.949	0.942	0.938	0.933	0.922	0.892	0.492	0.307	0.280	0.264	0.249
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.234	0.217	0.198	0.180	0.164	0.149	0.136	0.125	0.115	0.107	0.100	0.097	0.099	0.100	0.100	0.108	0.122	0.137	0.142	0.138
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.132	0.125	0.119	0.110	0.096	0.078	0.058	0.040	0.024	0.012	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R610

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.017
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.169	0.522	0.806	0.921	0.959	0.971	0.976	0.978	0.979	0.980	0.980	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.981	0.981	0.980	0.980	0.981	0.981	0.980	0.981	0.981	0.982	0.983	0.983	0.984	0.984	0.985	0.986	0.986	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.988	0.989	0.986	0.989	0.988	0.989	0.989	0.990	0.990	0.990	0.990	0.991	0.991	0.992	0.992	0.992				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.547	1.536	1.531	1.527	1.525	1.524	1.523
P	0.912	0.914	0.916	0.917	0.917	0.917	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

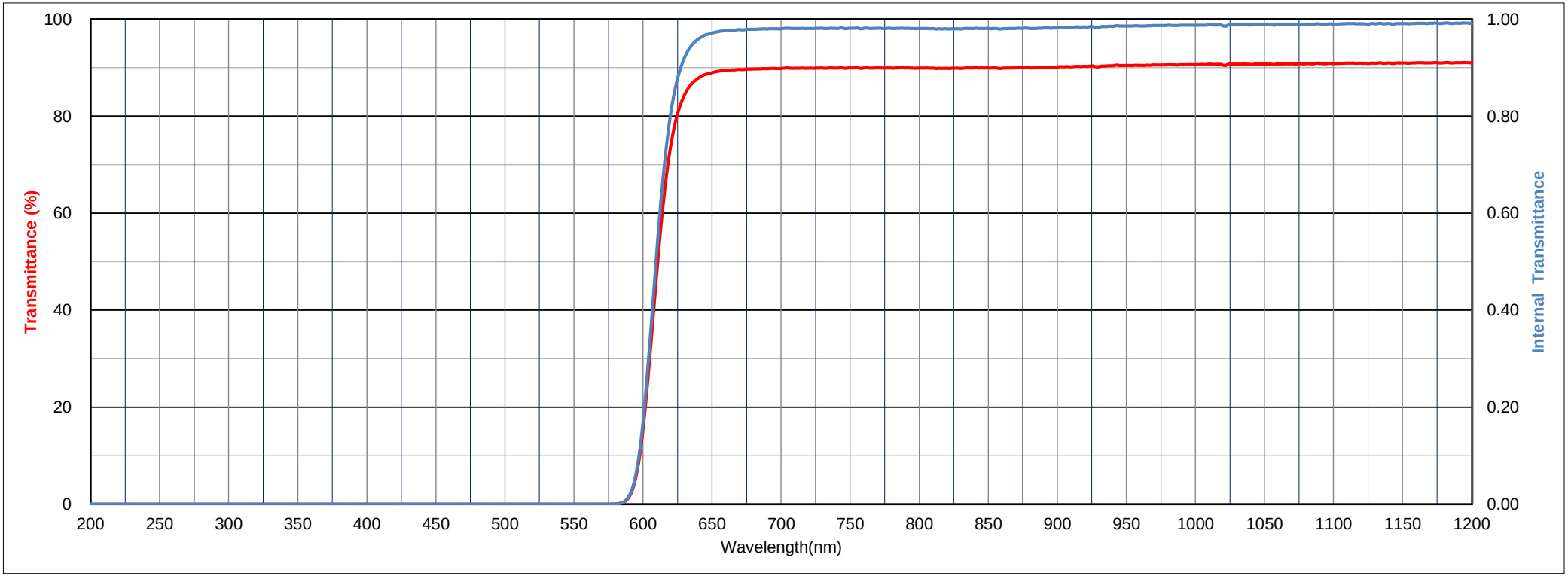
	x	y	Y	λ_d	P_e
A	0.698	0.301	17	624	100
C	0.696	0.304	10	622	100
D65	0.695	0.305	10	622	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	560	620	93	103	520	140	2.69

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
610±5	>540	>690



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

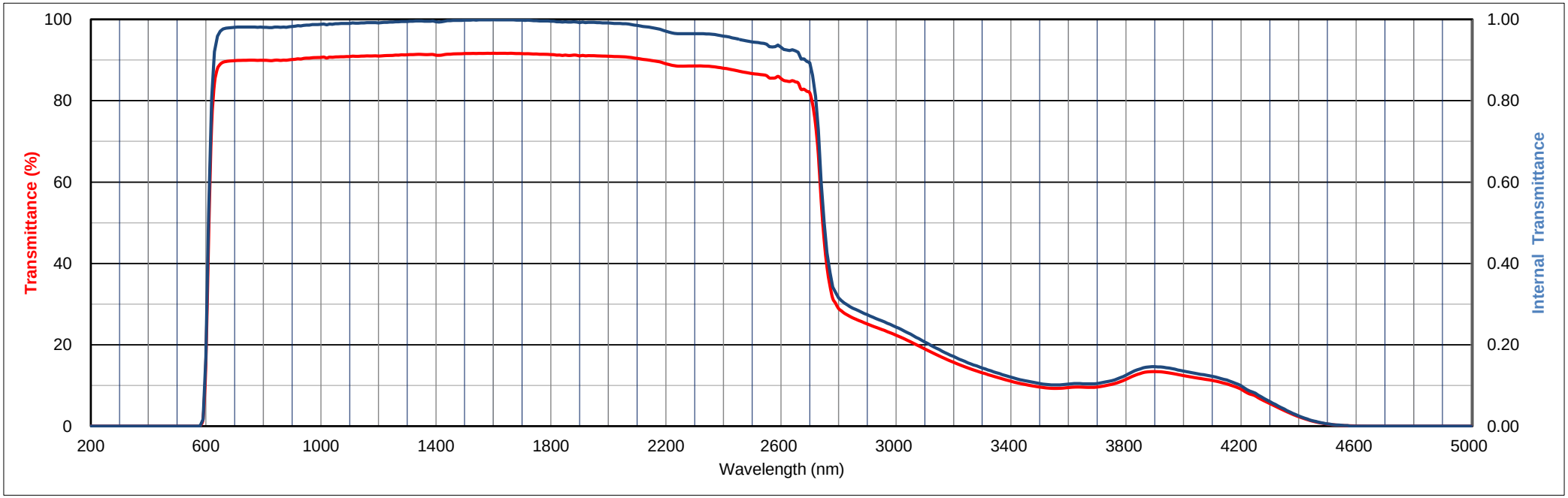
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R610

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.017
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.169	0.522	0.806	0.921	0.959	0.971	0.976	0.978	0.979	0.980	0.980	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981	0.981
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.981	0.981	0.980	0.980	0.981	0.981	0.980	0.981	0.981	0.982	0.983	0.983	0.984	0.984	0.985	0.986	0.986	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.988	0.989	0.986	0.989	0.988	0.989	0.989	0.990	0.990	0.990	0.990	0.991	0.991	0.991	0.991	0.991	0.992	0.992	0.992	0.992
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.992	0.992	0.993	0.993	0.993	0.993	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.995	0.995	0.996	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.993	0.994	0.995	0.996	0.996	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.999	0.998	0.999	0.999	0.999	0.999	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.996
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.995	0.995	0.994	0.994	0.993	0.994	0.993	0.993	0.994	0.994	0.992	0.993	0.992	0.993	0.992	0.992	0.992	0.992	0.991	0.991
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.991	0.990	0.985	0.980	0.971	0.965	0.965	0.964	0.959	0.952	0.945	0.939	0.931	0.922	0.893	0.500	0.315	0.290	0.274	0.259
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.244	0.226	0.207	0.188	0.171	0.156	0.143	0.131	0.120	0.112	0.105	0.101	0.103	0.104	0.105	0.112	0.125	0.141	0.146	0.143
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.135	0.129	0.122	0.113	0.099	0.081	0.061	0.042	0.025	0.013	0.006	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R630

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.001	0.013	0.148	0.503	0.802	0.925	0.963	0.974	0.978	0.980	0.981	0.982	0.982	0.981	0.982	0.982	0.982	0.982	0.981	0.982
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.981	0.980	0.980	0.980	0.981	0.981	0.981	0.982	0.981	0.982	0.983	0.984	0.984	0.984	0.986	0.986	0.986	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.988	0.989	0.986	0.989	0.988	0.989	0.989	0.989	0.990	0.990	0.991	0.990	0.991	0.992	0.992	0.992				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.547	1.536	1.530	1.526	1.524	1.522	1.521
P	0.912	0.914	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

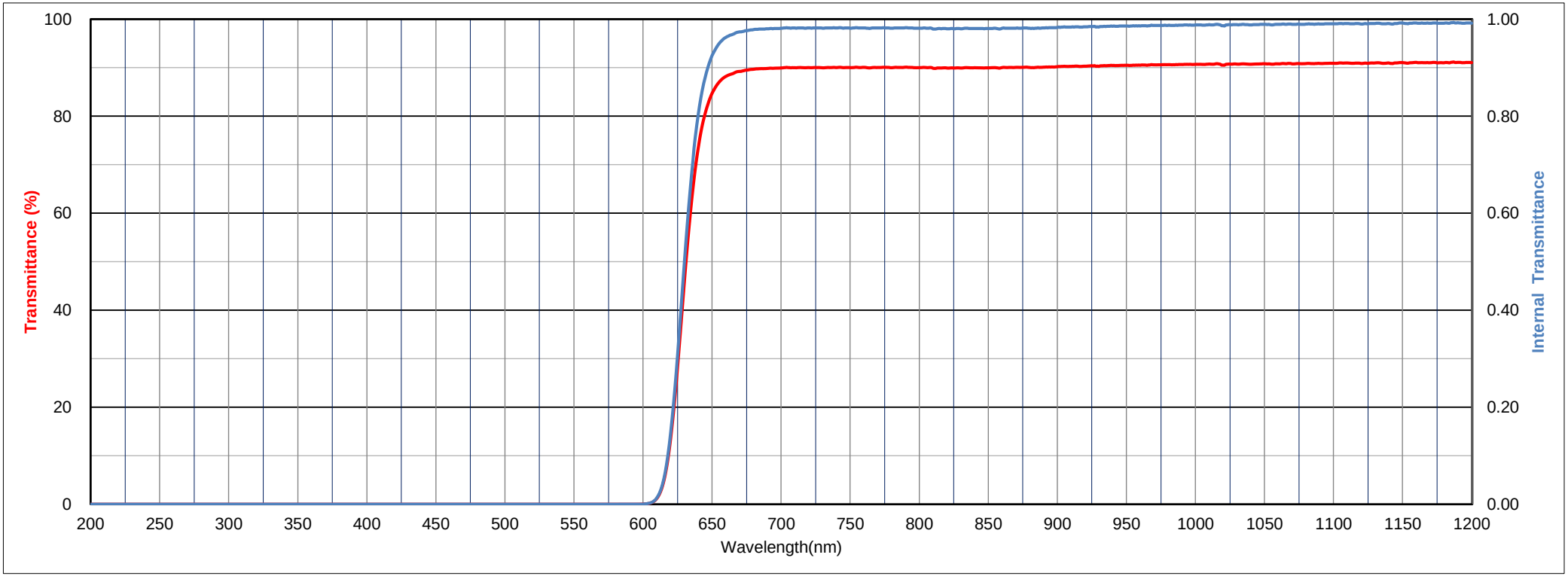
	x	y	Y	λ_d	P_e
A	0.718	0.281	8	639	100
C	0.717	0.283	4	638	100
D65	0.717	0.283	4	638	100

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	560	620	95	107	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
630±5	>550	>710



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HOYA

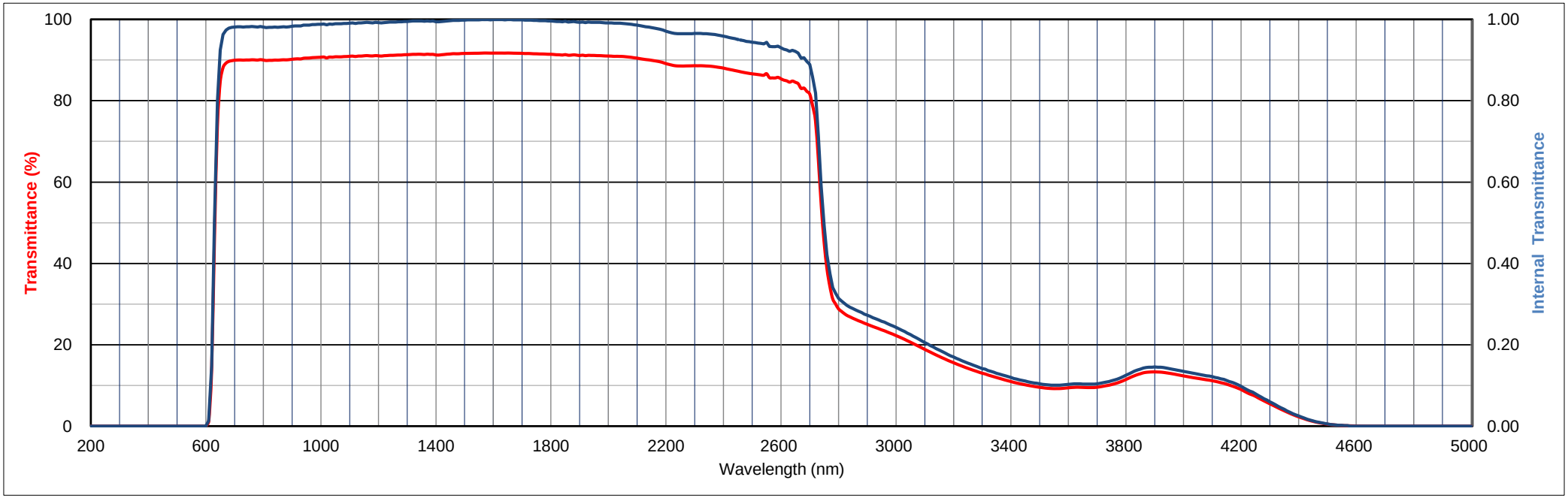
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-R630

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.001	0.013	0.148	0.503	0.802	0.925	0.963	0.974	0.978	0.980	0.981	0.982	0.982	0.981	0.982	0.982	0.982	0.982	0.981	0.982
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.981	0.980	0.980	0.980	0.981	0.981	0.981	0.982	0.981	0.982	0.983	0.984	0.984	0.984	0.986	0.986	0.986	0.987	0.987	0.988
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.988	0.989	0.986	0.989	0.988	0.989	0.989	0.989	0.990	0.990	0.991	0.991	0.990	0.991	0.991	0.992	0.992	0.992	0.992	0.992
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.992	0.991	0.992	0.993	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.995	0.996	0.996	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.994	0.995	0.995	0.996	0.997	0.998	0.997	0.997	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.997	0.997	0.997	0.997	0.997	0.996
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.996	0.995	0.995	0.995	0.994	0.995	0.993	0.994	0.995	0.994	0.993	0.994	0.992	0.993	0.993	0.993	0.992	0.992	0.992	0.991
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.991	0.990	0.986	0.980	0.971	0.965	0.965	0.964	0.959	0.951	0.944	0.944	0.930	0.921	0.889	0.493	0.314	0.289	0.273	0.258
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.243	0.225	0.206	0.187	0.170	0.155	0.142	0.130	0.119	0.111	0.104	0.101	0.103	0.104	0.104	0.111	0.125	0.140	0.145	0.142
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.135	0.128	0.122	0.112	0.098	0.080	0.060	0.041	0.025	0.013	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R645

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	0.002	0.047	0.319	0.696	0.890	0.951	0.971	0.978	0.981	0.982	0.983	0.983	0.983	0.983	0.983	0.983	0.983	0.983
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.983	0.983	0.982	0.982	0.982	0.982	0.983	0.983	0.983	0.983	0.984	0.986	0.986	0.986	0.987	0.988	0.988	0.989	0.989	0.989
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.990	0.990	0.989	0.990	0.990	0.991	0.991	0.992	0.992	0.992	0.993	0.992	0.994	0.994	0.994	0.994				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.547	1.536	1.531	1.527	1.525	1.523	1.522
P	0.912	0.914	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

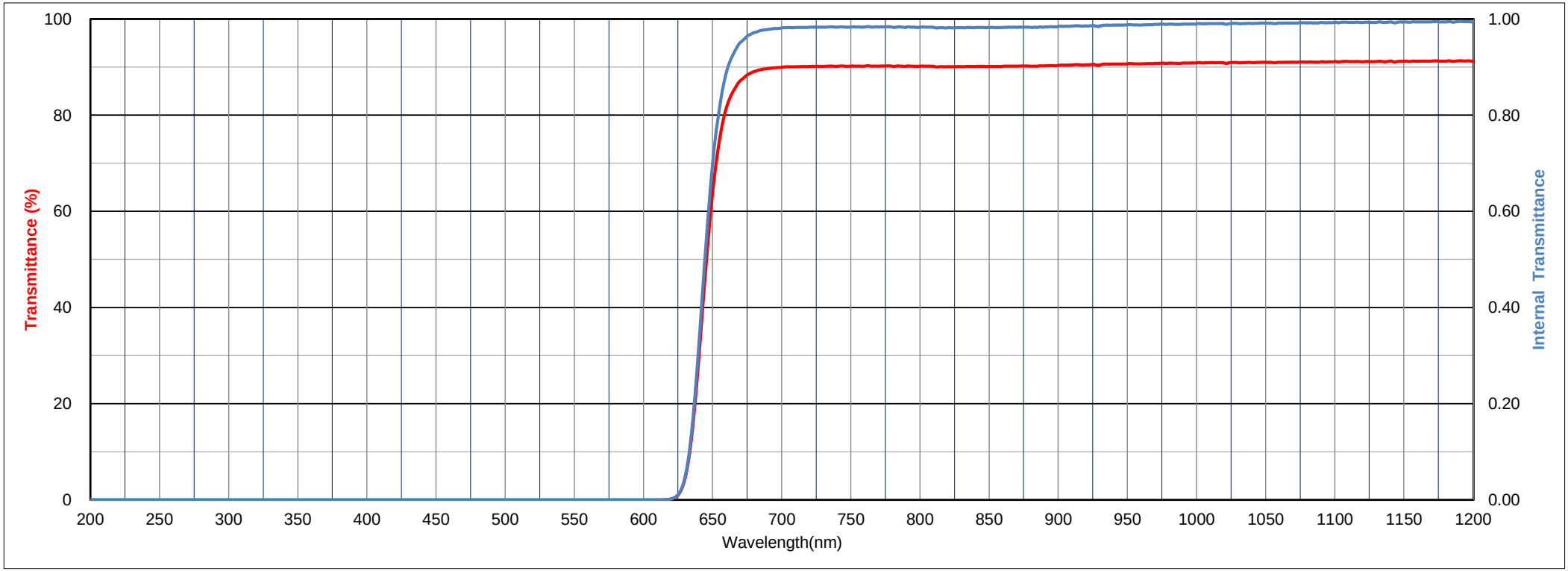
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	555	620	94	106	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
645±5	>560	>720



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

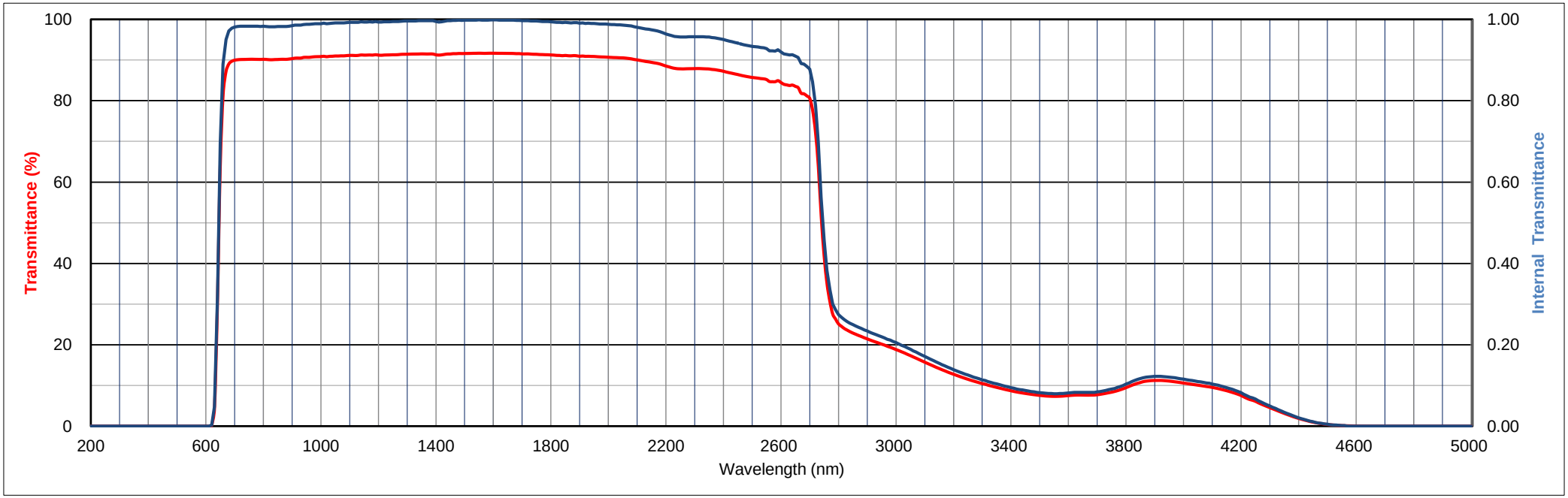
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-R645

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	0.002	0.047	0.319	0.696	0.890	0.951	0.971	0.978	0.981	0.982	0.983	0.983	0.983	0.983	0.983	0.983	0.983	0.983
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.983	0.983	0.982	0.982	0.982	0.982	0.983	0.983	0.983	0.983	0.984	0.986	0.986	0.986	0.987	0.988	0.988	0.989	0.989	0.989
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.990	0.990	0.989	0.990	0.990	0.991	0.991	0.992	0.992	0.992	0.993	0.993	0.992	0.993	0.994	0.994	0.994	0.994	0.994	0.995
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.994	0.993	0.994	0.994	0.994	0.994	0.994	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.997	0.997	0.996	0.997	0.996
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.994	0.994	0.995	0.996	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.999	0.998	0.998	0.998	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.999	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.997	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.994	0.994	0.993	0.993	0.992	0.993	0.992	0.992	0.992	0.992	0.990	0.991	0.990	0.990	0.990	0.990	0.989	0.989	0.989	0.988
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.988	0.986	0.981	0.974	0.964	0.957	0.957	0.956	0.950	0.941	0.934	0.928	0.920	0.910	0.878	0.457	0.274	0.249	0.234	0.220
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.205	0.189	0.171	0.154	0.139	0.126	0.114	0.104	0.095	0.088	0.082	0.080	0.082	0.083	0.084	0.091	0.103	0.117	0.122	0.121
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.115	0.110	0.104	0.095	0.082	0.066	0.050	0.034	0.021	0.011	0.005	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R665

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.013	0.263	0.663	0.863	0.931	0.955	0.964	0.968	0.970	0.971	0.972	0.973
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.974	0.973	0.973	0.974	0.974	0.975	0.975	0.976	0.976	0.977	0.978	0.979	0.980	0.980	0.983	0.983	0.983	0.985	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.986	0.986	0.985	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.990	0.991	0.991	0.991	0.991				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.546	1.535	1.530	1.526	1.523	1.522	1.521
P	0.912	0.915	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

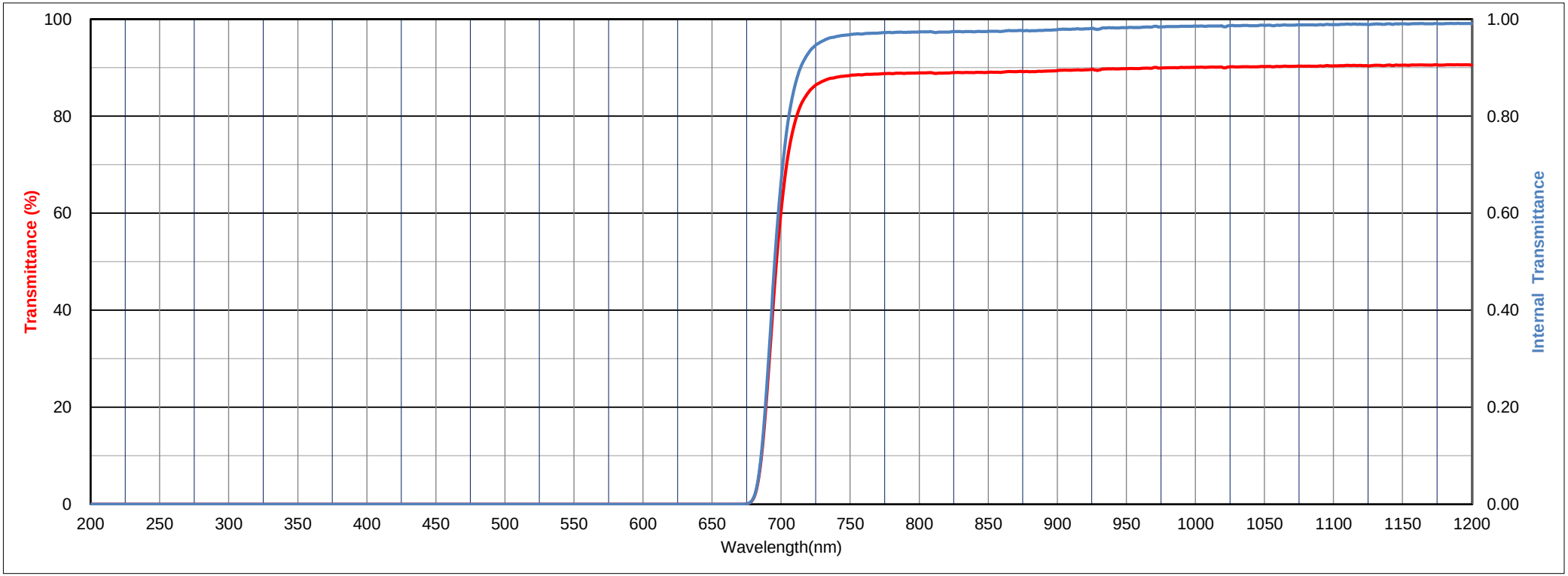
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	555	620	94	106	520	140	2.68

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
665±5	>580	>750



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

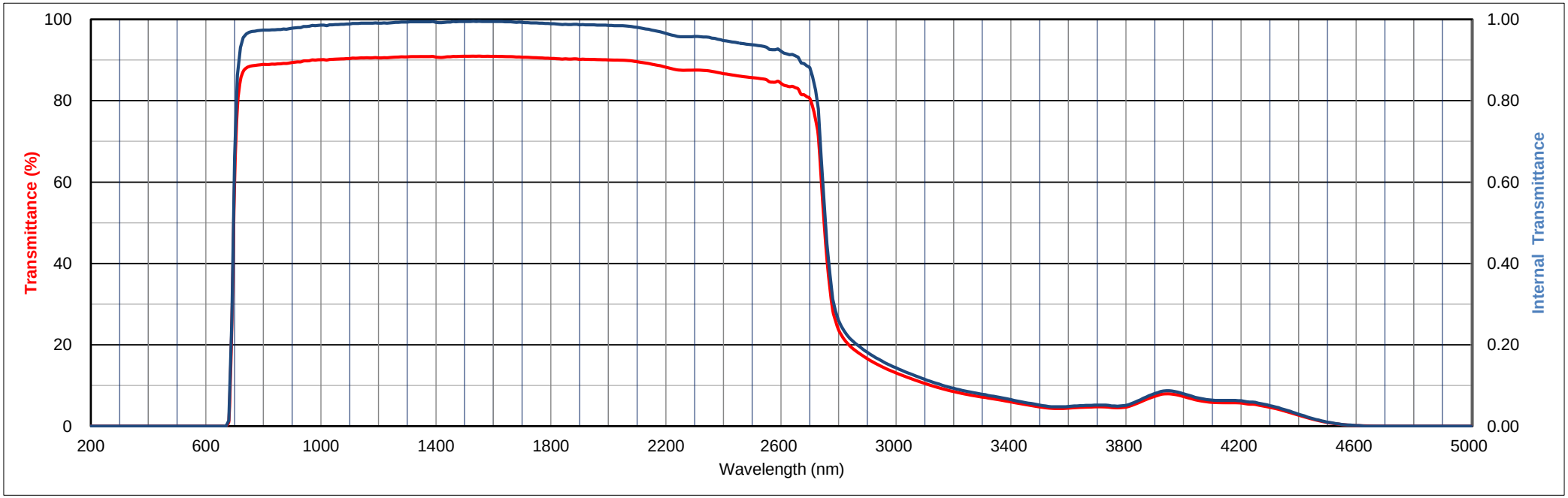
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-R665

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.013	0.263	0.663	0.863	0.931	0.955	0.964	0.968	0.970	0.971	0.972	0.973
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.974	0.973	0.973	0.974	0.974	0.975	0.975	0.976	0.976	0.977	0.978	0.979	0.980	0.980	0.983	0.983	0.983	0.985	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.986	0.986	0.985	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.990	0.990	0.990	0.991	0.990	0.991	0.991	0.991	0.991
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.991	0.991	0.991	0.991	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.994	0.994	0.994	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.992	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.995	0.995	0.994	0.994	0.994	0.994	0.994	0.994	0.993	0.993	0.992	0.992	0.992	0.992	0.991	0.991	0.991	0.990	0.990	0.990
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.989	0.989	0.988	0.988	0.987	0.988	0.987	0.987	0.988	0.988	0.987	0.987	0.987	0.987	0.986	0.986	0.986	0.986	0.986	0.986
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.985	0.984	0.980	0.974	0.965	0.958	0.958	0.956	0.948	0.942	0.937	0.932	0.922	0.910	0.882	0.548	0.260	0.209	0.182	0.160
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.143	0.129	0.115	0.103	0.093	0.085	0.078	0.072	0.065	0.058	0.052	0.048	0.048	0.051	0.052	0.050	0.051	0.065	0.080	0.087
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.080	0.069	0.064	0.063	0.062	0.058	0.051	0.041	0.030	0.019	0.010	0.004	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R695

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.013	0.263	0.663	0.863	0.931	0.955	0.964	0.968	0.970	0.971	0.972	0.973
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.974	0.973	0.973	0.974	0.974	0.975	0.975	0.976	0.976	0.977	0.978	0.979	0.980	0.980	0.983	0.983	0.983	0.985	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.986	0.986	0.985	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.990	0.991	0.991	0.991	0.991				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.562	1.552	1.547	1.543	1.541	1.539	1.538
P	0.908	0.911	0.912	0.913	0.913	0.914	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

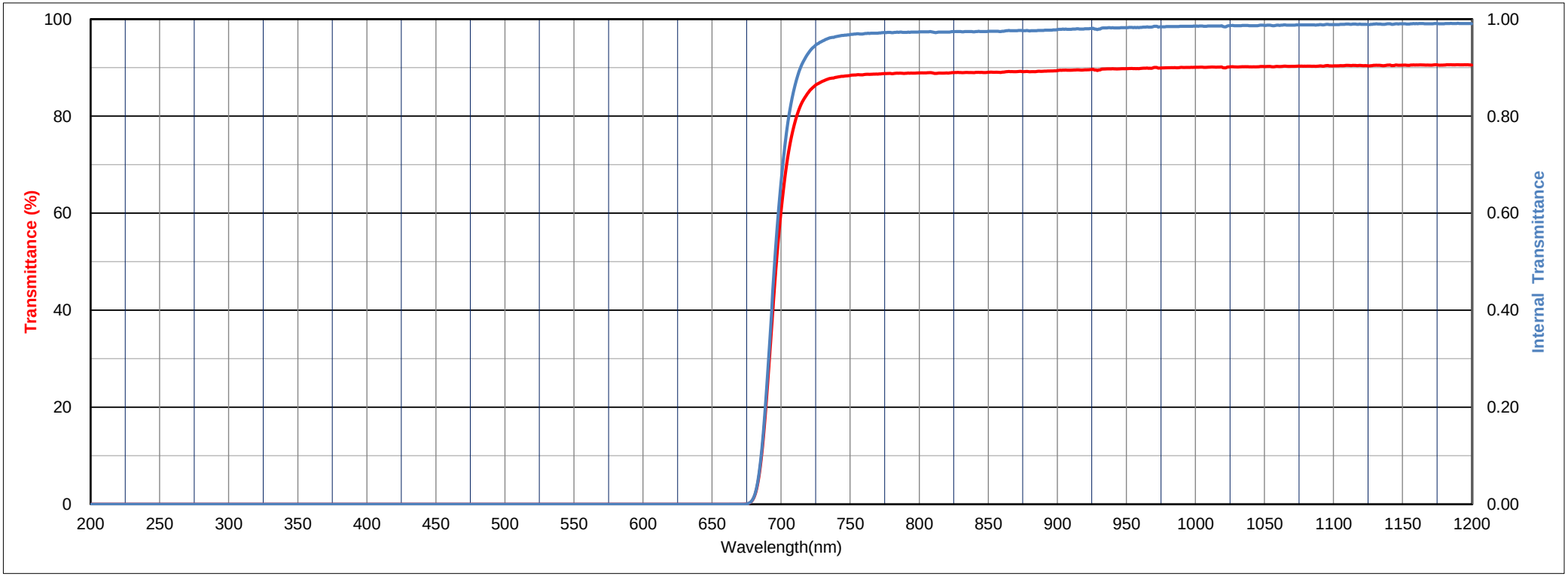
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	525	575	98	115	470	160	2.86

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
695±5	>610	>780



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HOYA

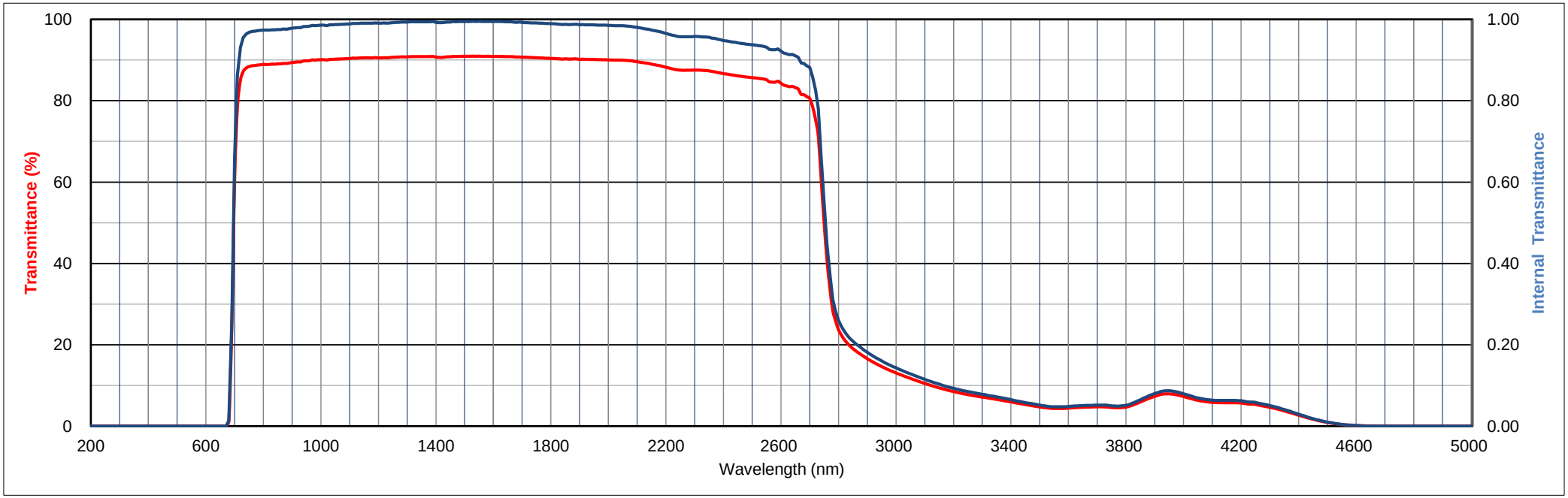
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R695

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.013	0.263	0.663	0.863	0.931	0.955	0.964	0.968	0.970	0.971	0.972	0.973
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.974	0.973	0.973	0.974	0.974	0.975	0.975	0.976	0.976	0.977	0.978	0.979	0.980	0.980	0.983	0.983	0.983	0.985	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.986	0.986	0.985	0.986	0.987	0.987	0.987	0.988	0.988	0.989	0.989	0.990	0.990	0.990	0.991	0.990	0.991	0.991	0.991	0.991
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.991	0.991	0.991	0.991	0.992	0.992	0.993	0.993	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.994	0.994	0.994	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.992	0.993	0.993	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.995	0.995	0.994	0.994	0.994	0.994	0.994	0.994	0.993	0.993	0.992	0.992	0.992	0.992	0.991	0.991	0.991	0.990	0.990	0.990
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.989	0.989	0.988	0.988	0.987	0.988	0.987	0.987	0.988	0.988	0.987	0.987	0.987	0.987	0.986	0.986	0.986	0.986	0.986	0.986
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.985	0.984	0.980	0.974	0.965	0.958	0.958	0.956	0.948	0.942	0.937	0.932	0.922	0.910	0.882	0.548	0.260	0.209	0.182	0.160
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.143	0.129	0.115	0.103	0.093	0.085	0.078	0.072	0.065	0.058	0.052	0.048	0.048	0.051	0.052	0.050	0.051	0.065	0.080	0.087
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.080	0.069	0.064	0.063	0.062	0.058	0.051	0.041	0.030	0.019	0.010	0.004	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-R715

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.023	0.301	0.681	0.856	0.914	0.933	0.943	0.946	0.949	0.953
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.954	0.954	0.957	0.958	0.960	0.962	0.963	0.964	0.965	0.967	0.969	0.970	0.971	0.974	0.974	0.975	0.976	0.978	0.979	0.979
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.980	0.981	0.979	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.986	0.986	0.987	0.989	0.989	0.988				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.567	1.555	1.549	1.545	1.542	1.541	1.540
P	0.907	0.910	0.911	0.912	0.913	0.913	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

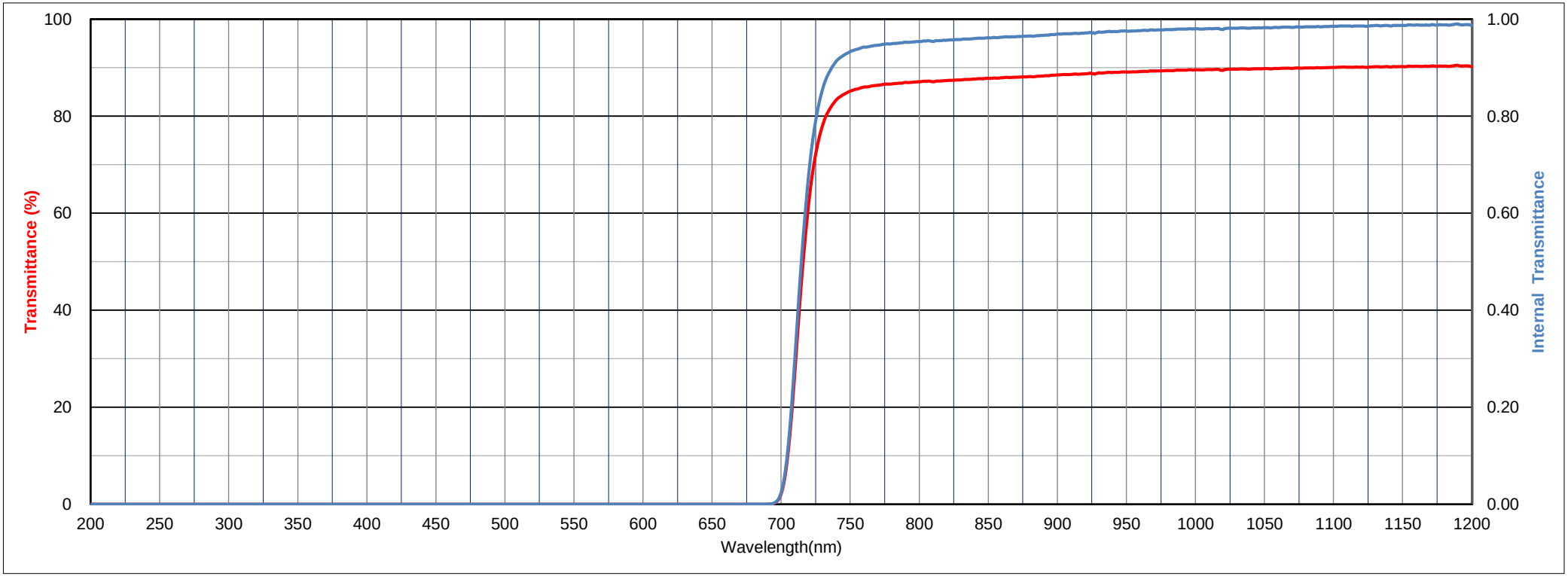
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	525	575	100	116	470	160	2.86

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
715±8	>630	>810



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

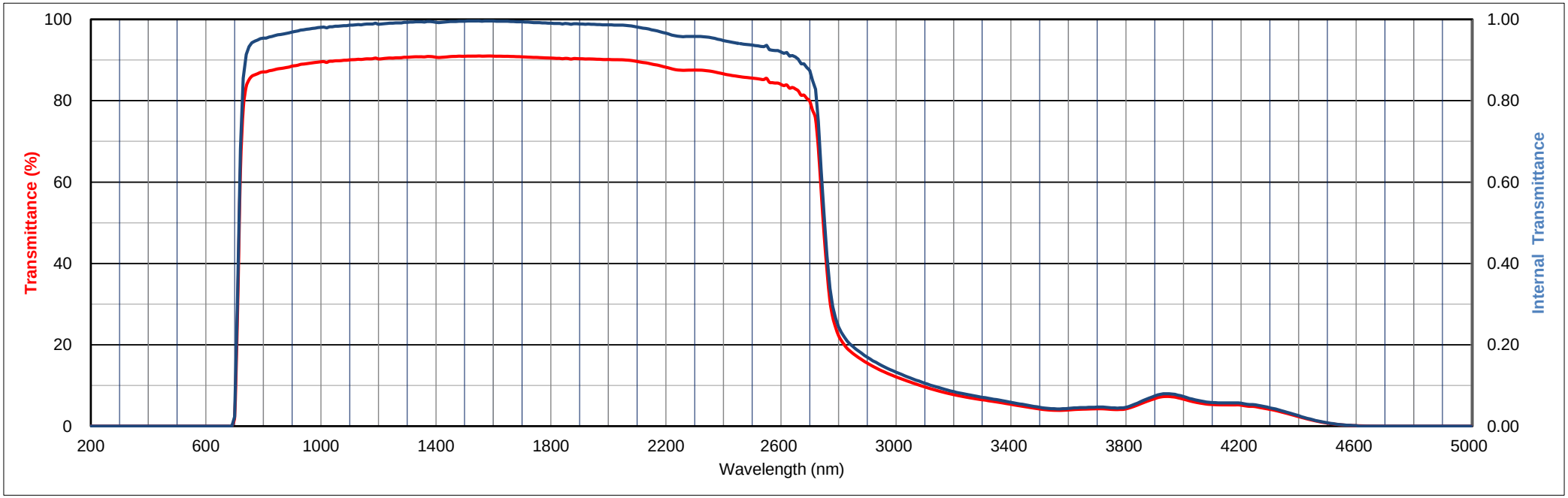
HOYA CORPORATION OPTICS SECTION

Internal Transmittance (τ)

Thickness 3.00 mm

W-R715

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.023	0.301	0.681	0.856	0.914	0.933	0.943	0.946	0.949	0.953
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.954	0.954	0.957	0.958	0.960	0.962	0.963	0.964	0.965	0.967	0.969	0.970	0.971	0.974	0.974	0.975	0.976	0.978	0.979	0.979
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.980	0.981	0.979	0.982	0.982	0.983	0.983	0.984	0.985	0.985	0.986	0.986	0.986	0.987	0.987	0.988	0.989	0.988	0.989	0.991
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.988	0.988	0.989	0.990	0.991	0.990	0.991	0.991	0.992	0.993	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.995	0.995	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.993	0.993	0.994	0.995	0.995	0.995	0.996	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.995	0.996	0.995	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.993	0.993	0.993	0.992	0.992	0.992	0.991	0.991	0.991
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.991	0.990	0.990	0.990	0.989	0.990	0.989	0.988	0.989	0.989	0.989	0.989	0.988	0.988	0.988	0.988	0.987	0.987	0.987	0.987
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.987	0.986	0.981	0.974	0.966	0.958	0.958	0.956	0.948	0.941	0.937	0.936	0.920	0.908	0.875	0.516	0.244	0.196	0.170	0.149
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.133	0.119	0.106	0.094	0.085	0.077	0.071	0.065	0.059	0.052	0.046	0.043	0.044	0.046	0.047	0.045	0.047	0.060	0.074	0.080
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.073	0.063	0.058	0.057	0.057	0.052	0.045	0.036	0.026	0.016	0.008	0.003	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR760

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.004	0.046	0.229	0.532	0.765	0.884	0.934
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.956	0.965	0.969	0.971	0.973	0.974	0.975	0.976	0.976	0.977	0.978	0.980	0.980	0.980	0.983	0.983	0.983	0.984	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.985	0.986	0.984	0.987	0.986	0.987	0.988	0.988	0.988	0.988	0.988	0.989	0.991	0.990	0.991	0.990				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.584	1.572	1.566	1.561	1.559	1.557	1.555
P	0.903	0.906	0.907	0.908	0.909	0.909	0.910

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

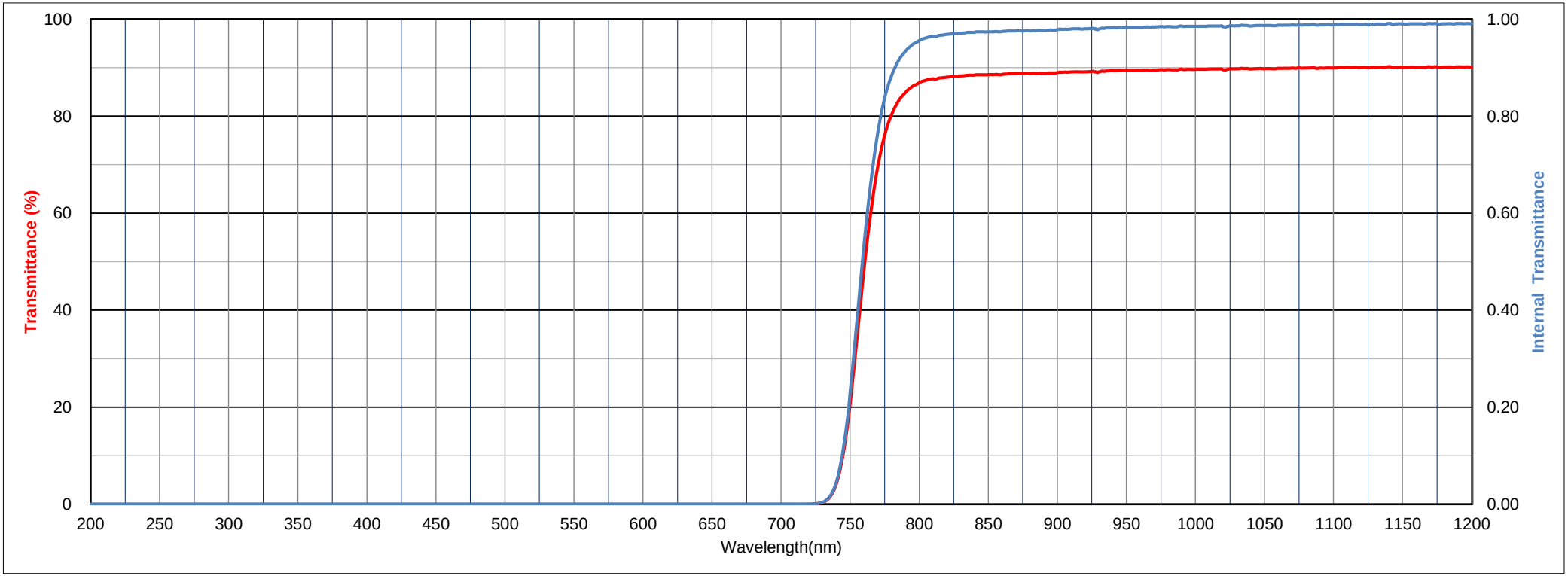
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	550	605	-	108	415	200	2.97

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
760±8	>680	>880



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HOYA

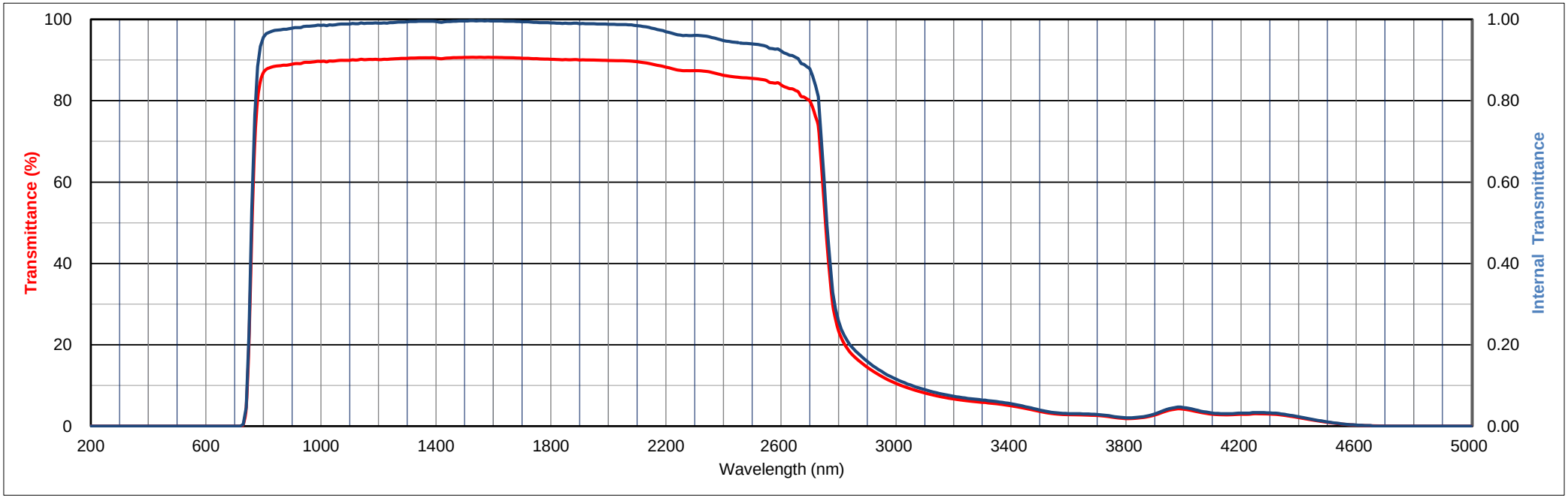
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR760

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.004	0.046	0.229	0.532	0.765	0.884	0.934
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.956	0.965	0.969	0.971	0.973	0.974	0.975	0.976	0.976	0.977	0.978	0.980	0.980	0.980	0.983	0.983	0.983	0.984	0.985	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.985	0.986	0.984	0.987	0.986	0.987	0.988	0.988	0.988	0.988	0.988	0.990	0.989	0.990	0.991	0.990	0.990	0.991	0.991	0.991
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.990	0.990	0.991	0.991	0.992	0.992	0.993	0.993	0.994	0.994	0.994	0.994	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.993	0.993	0.994	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.996	0.997	0.996	0.996	0.997	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.993	0.993	0.993	0.992	0.992	0.992	0.992
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.991	0.991	0.991	0.990	0.990	0.990	0.990	0.990	0.990	0.990	0.989	0.990	0.989	0.989	0.989	0.989	0.989	0.989	0.988	0.988
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.988	0.987	0.985	0.978	0.970	0.961	0.960	0.958	0.948	0.943	0.940	0.934	0.922	0.907	0.879	0.603	0.258	0.192	0.159	0.135
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.115	0.101	0.090	0.081	0.074	0.068	0.064	0.061	0.055	0.048	0.040	0.033	0.031	0.030	0.029	0.024	0.020	0.023	0.030	0.043
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.046	0.039	0.032	0.031	0.032	0.034	0.033	0.029	0.023	0.016	0.010	0.006	0.003	0.001	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR780

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.002	0.031	0.194	0.492	0.736
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.864	0.916	0.940	0.952	0.957	0.961	0.964	0.965	0.966	0.969	0.971	0.972	0.974	0.975	0.976	0.977	0.978	0.980	0.981	0.982
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.982	0.982	0.984	0.984	0.984	0.984	0.985	0.985	0.986	0.986	0.987	0.987	0.987	0.989	0.990	0.989				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.586	1.573	1.566	1.562	1.559	1.557	1.556
P	0.902	0.905	0.907	0.908	0.909	0.909	0.910

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

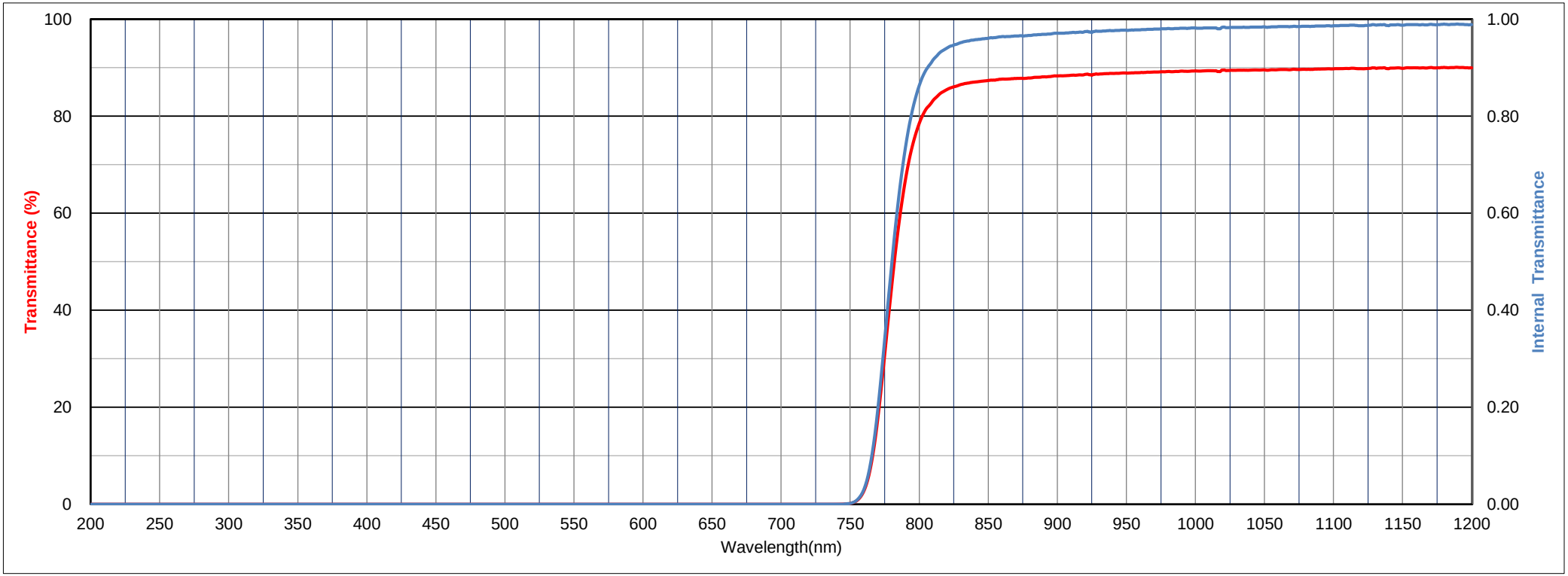
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	550	605	-	108	415	200	2.97

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
780±8	>690	>900



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HOYA

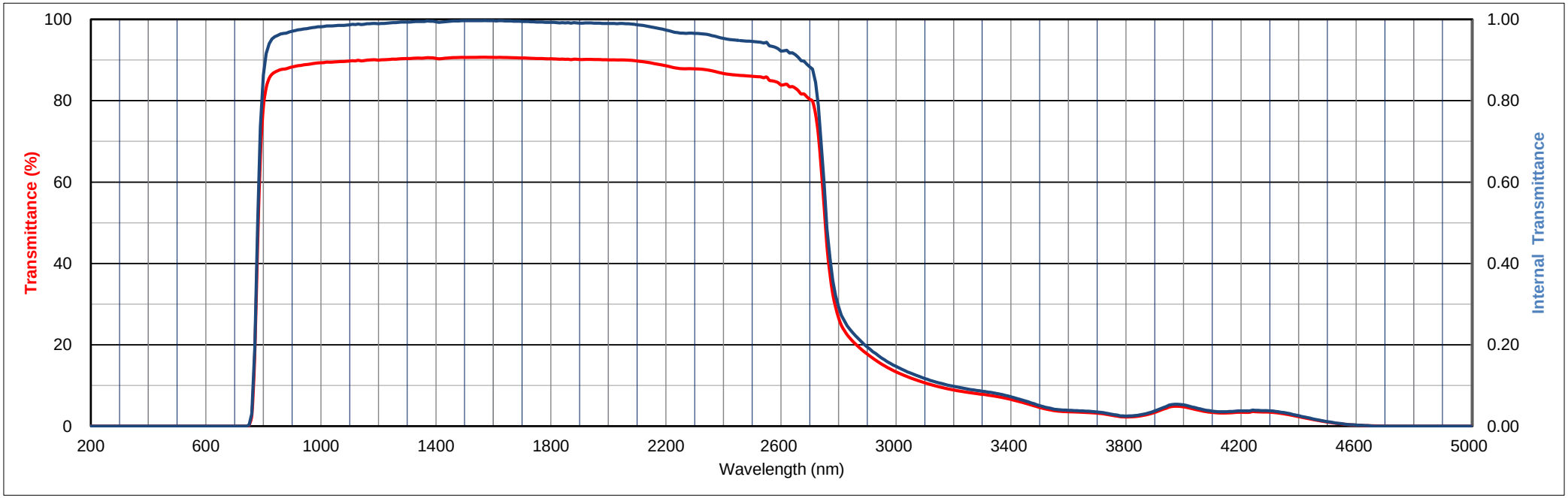
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR780

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.002	0.031	0.194	0.492	0.736
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.864	0.916	0.940	0.952	0.957	0.961	0.964	0.965	0.966	0.969	0.971	0.972	0.974	0.975	0.976	0.977	0.978	0.980	0.981	0.982
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.982	0.982	0.984	0.984	0.984	0.984	0.985	0.985	0.986	0.986	0.987	0.988	0.987	0.989	0.987	0.988	0.989	0.990	0.990	0.990
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.989	0.990	0.990	0.991	0.991	0.992	0.992	0.993	0.993	0.993	0.994	0.993	0.994	0.994	0.995	0.994	0.995	0.996	0.996	0.995
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.993	0.993	0.994	0.995	0.995	0.996	0.996	0.996	0.997	0.996	0.996	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.997
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.997	0.996	0.997	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994	0.993	0.993	0.993	0.993
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.992	0.992	0.992	0.992	0.991	0.992	0.990	0.992	0.992	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.990	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.990	0.990	0.987	0.981	0.974	0.966	0.966	0.962	0.953	0.948	0.945	0.944	0.922	0.913	0.883	0.595	0.294	0.229	0.195	0.168
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.147	0.131	0.117	0.106	0.098	0.091	0.086	0.080	0.072	0.062	0.050	0.042	0.039	0.037	0.035	0.029	0.025	0.028	0.037	0.052
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.052	0.044	0.037	0.036	0.038	0.039	0.038	0.033	0.026	0.018	0.011	0.006	0.003	0.001	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR800

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.007	0.047	0.193
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.460	0.702	0.842	0.911	0.942	0.956	0.962	0.967	0.968	0.970	0.972	0.973	0.975	0.975	0.977	0.978	0.979	0.980	0.981	0.981
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.982	0.983	0.981	0.983	0.983	0.984	0.984	0.985	0.985	0.985	0.986	0.987	0.987	0.988	0.988	0.988				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.590	1.576	1.570	1.565	1.562	1.560	1.559
P	0.901	0.905	0.906	0.907	0.908	0.909	0.909

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

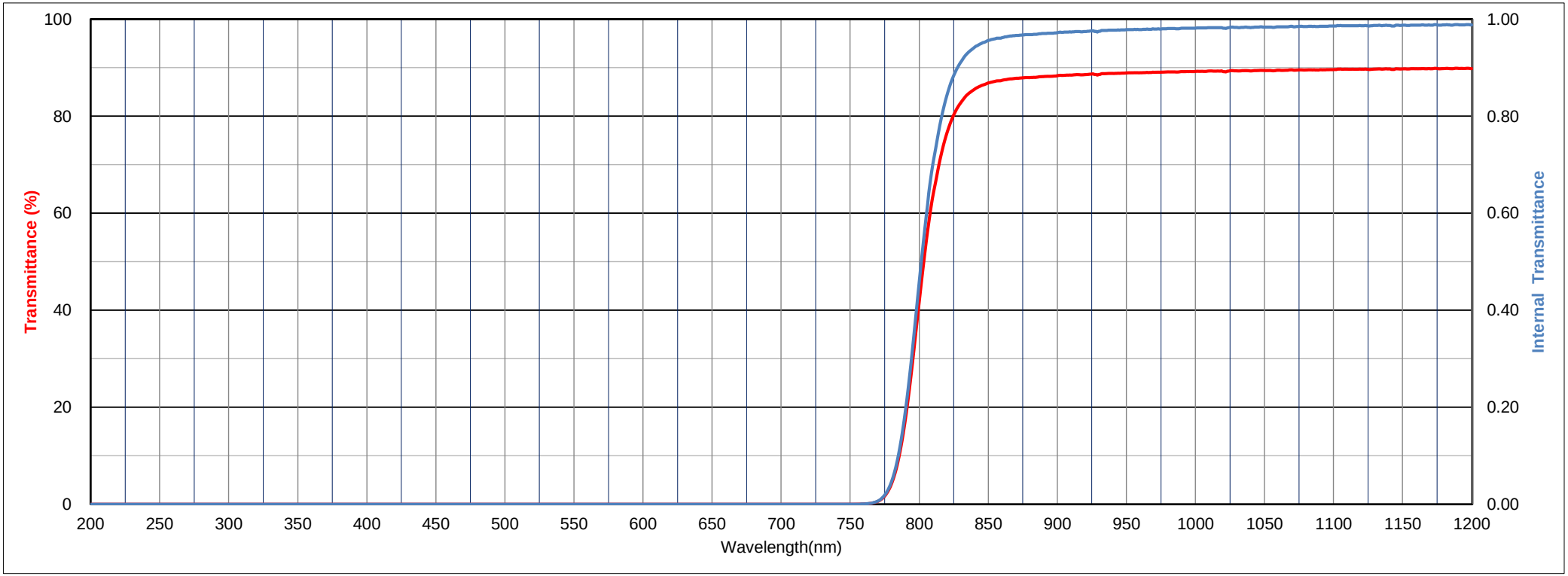
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	555	610	-	102	425	190	3.01

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
800±8	>710	>920



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HOYA

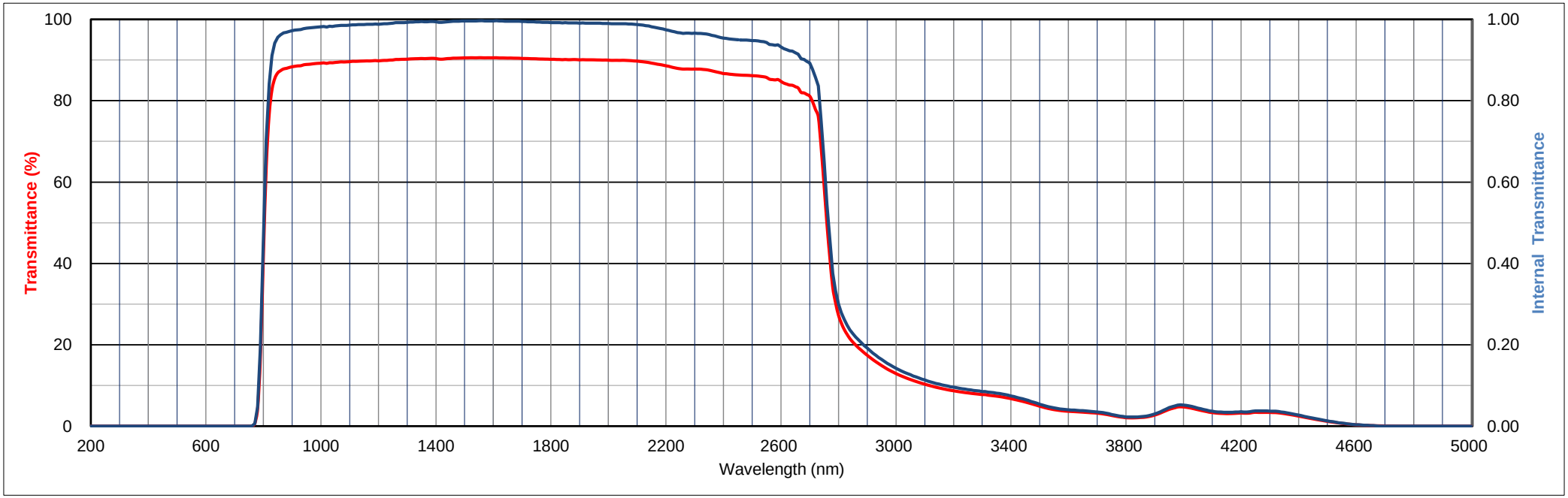
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR800

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.007	0.047	0.193
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.460	0.702	0.842	0.911	0.942	0.956	0.962	0.967	0.968	0.970	0.972	0.973	0.975	0.975	0.977	0.978	0.979	0.980	0.981	0.981
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.982	0.983	0.981	0.983	0.983	0.984	0.984	0.985	0.985	0.985	0.986	0.987	0.987	0.987	0.987	0.988	0.988	0.988	0.988	0.989
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.988	0.989	0.989	0.989	0.990	0.990	0.992	0.992	0.992	0.992	0.993	0.993	0.994	0.994	0.994	0.994	0.994	0.994	0.995	0.995
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.994	0.993	0.993	0.993	0.994	0.994	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.996	0.996	0.996	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994	0.994	0.993	0.993	0.993	0.993
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.992	0.992	0.992	0.992	0.991	0.992	0.991	0.991	0.992	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.990	0.990	0.990	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.990	0.990	0.987	0.982	0.975	0.967	0.966	0.963	0.954	0.950	0.948	0.943	0.932	0.918	0.893	0.651	0.300	0.227	0.192	0.164
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.142	0.126	0.113	0.103	0.096	0.090	0.085	0.081	0.074	0.065	0.054	0.045	0.040	0.038	0.035	0.029	0.023	0.023	0.030	0.045
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.052	0.044	0.037	0.034	0.035	0.037	0.037	0.034	0.027	0.020	0.013	0.008	0.004	0.002	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR830

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.001
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.010	0.057	0.212	0.477	0.708	0.852	0.920	0.951	0.964	0.971	0.976	0.979	0.980	0.980	0.983	0.984	0.984	0.985	0.986	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.986	0.988	0.986	0.988	0.988	0.989	0.989	0.990	0.990	0.990	0.992	0.991	0.992	0.993	0.993	0.992				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.594	1.579	1.572	1.568	1.565	1.563	1.562
P	0.900	0.904	0.906	0.907	0.907	0.908	0.908

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

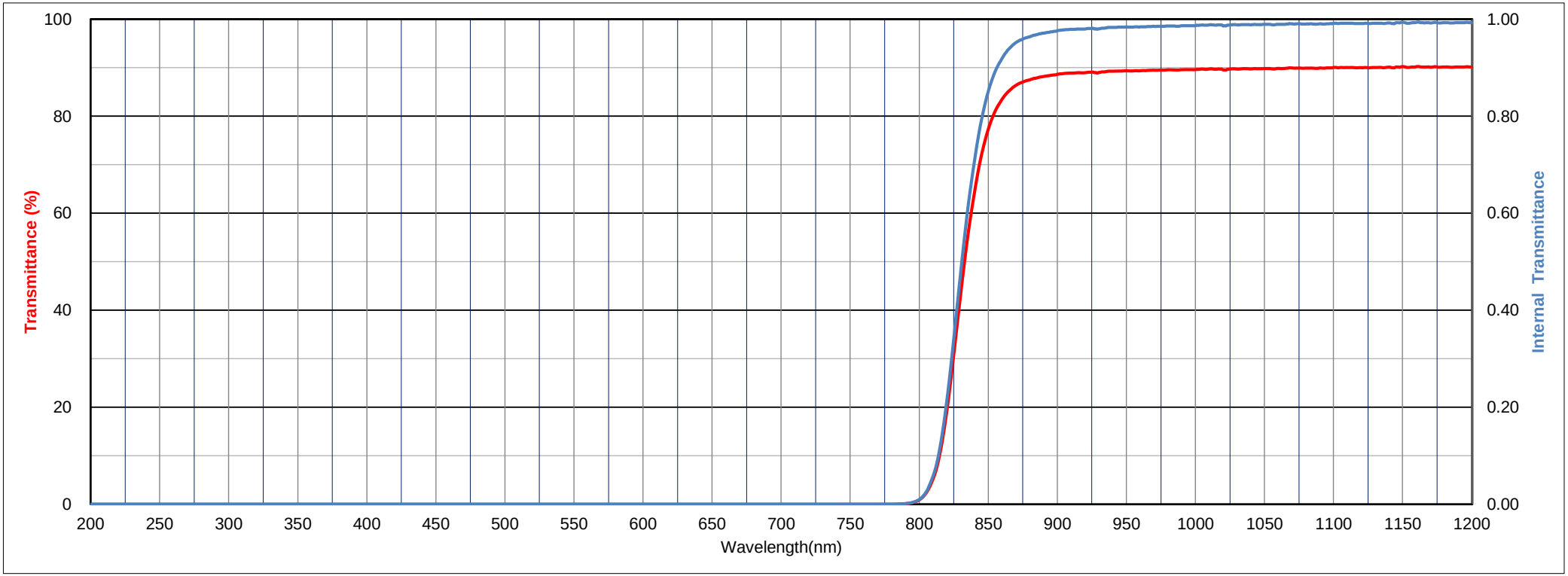
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	545	615	-	104	425	190	3.03

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
830±8	>730	>950



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HOYA

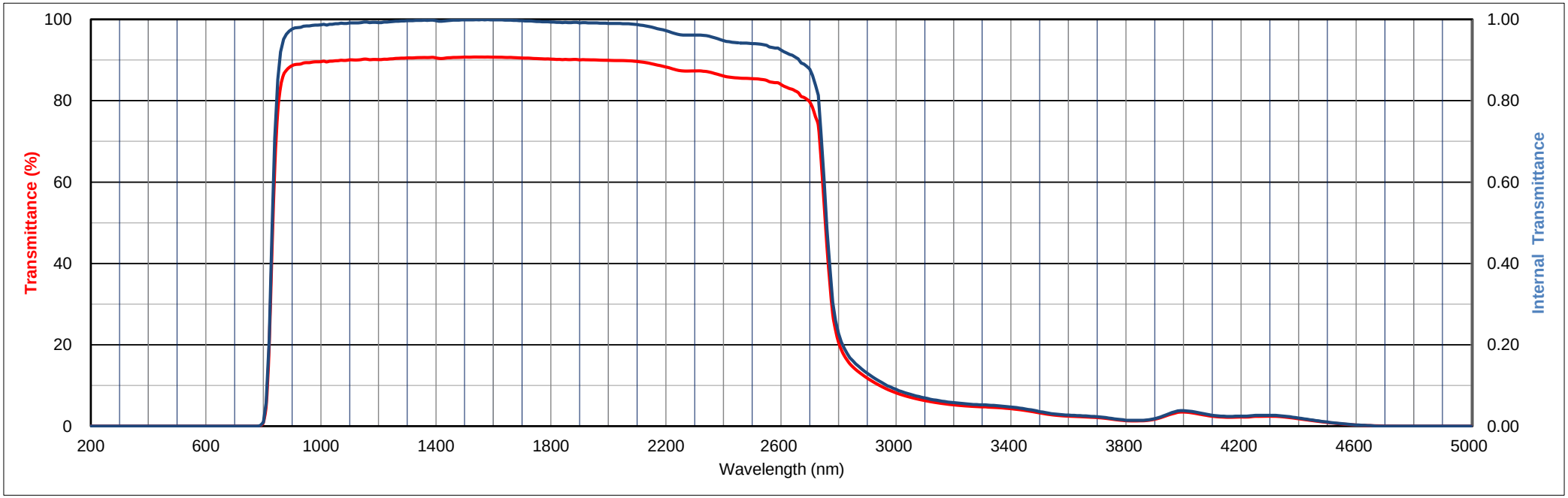
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR830

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.001
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.010	0.057	0.212	0.477	0.708	0.852	0.920	0.951	0.964	0.971	0.976	0.979	0.980	0.980	0.983	0.984	0.984	0.985	0.986	0.986
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.986	0.988	0.986	0.988	0.988	0.989	0.989	0.990	0.990	0.990	0.992	0.991	0.991	0.991	0.992	0.994	0.993	0.992	0.993	0.993
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.992	0.992	0.993	0.993	0.994	0.994	0.995	0.996	0.996	0.996	0.997	0.997	0.997	0.997	0.998	0.998	0.998	0.998	0.998	0.998
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.997	0.996	0.995	0.996	0.997	0.997	0.998	0.998	0.998	0.998	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999	0.999
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.999	0.999	0.999	0.999	0.998	0.998	0.998	0.998	0.997	0.997	0.997	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.994	0.994
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.993	0.993	0.993	0.993	0.992	0.993	0.992	0.992	0.993	0.993	0.992	0.992	0.992	0.992	0.991	0.991	0.991	0.991	0.991	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.990	0.990	0.987	0.981	0.972	0.962	0.962	0.959	0.948	0.943	0.941	0.936	0.925	0.907	0.878	0.602	0.228	0.160	0.130	0.107
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.090	0.078	0.069	0.063	0.058	0.054	0.052	0.050	0.047	0.042	0.036	0.030	0.027	0.025	0.023	0.019	0.015	0.015	0.019	0.031
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.038	0.033	0.027	0.024	0.025	0.026	0.027	0.025	0.020	0.015	0.010	0.006	0.003	0.001	0.001	0.001	<1E-05	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR850

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	<1E-05	0.001	0.010	0.069	0.253	0.530	0.738	0.846	0.897	0.925	0.940	0.948	0.953	0.956	0.961	0.963	0.965	0.967	0.969	0.970
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.971	0.973	0.972	0.975	0.976	0.978	0.978	0.979	0.980	0.981	0.982	0.983	0.984	0.986	0.986	0.987				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.596	1.582	1.575	1.570	1.567	1.565	1.564
P	0.900	0.903	0.905	0.906	0.907	0.907	0.908

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

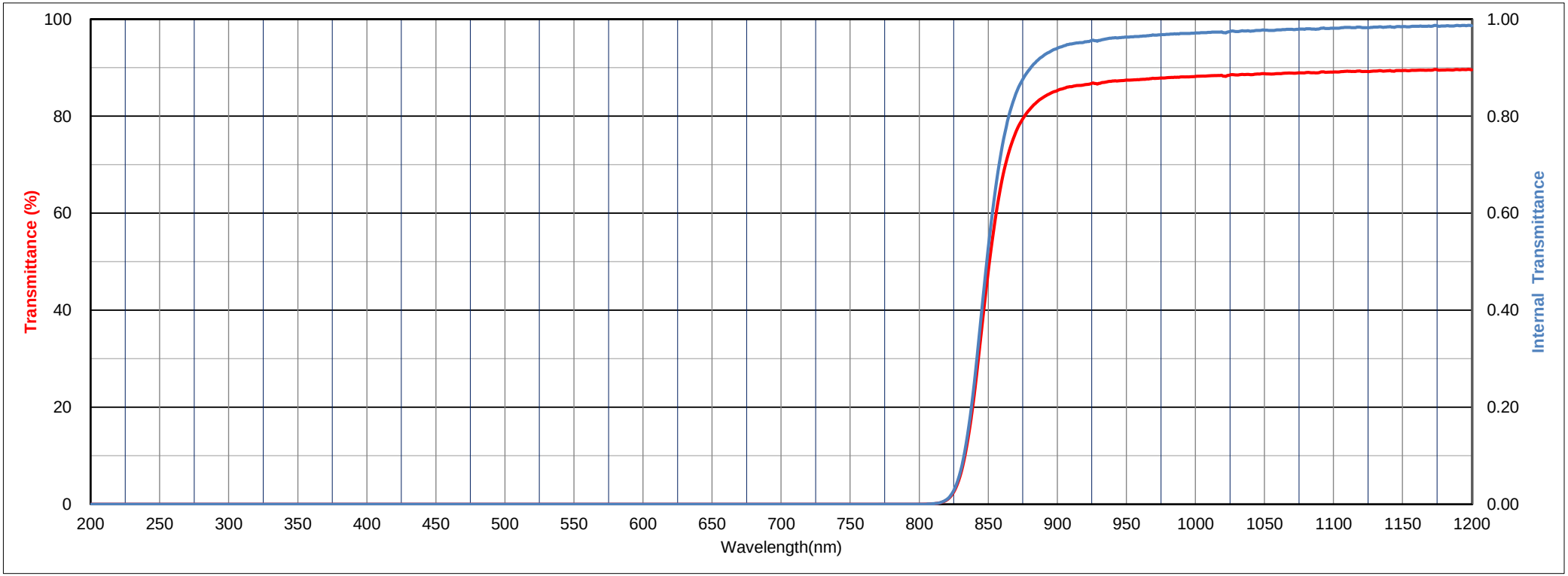
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	550	610	-	104	420	190	3.04

Tolerance of Transmittance (τ)

$\lambda\tau_{0.5}$ (nm)	λL (nm)	λH (nm)
850±8	>740	>950



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HOYA

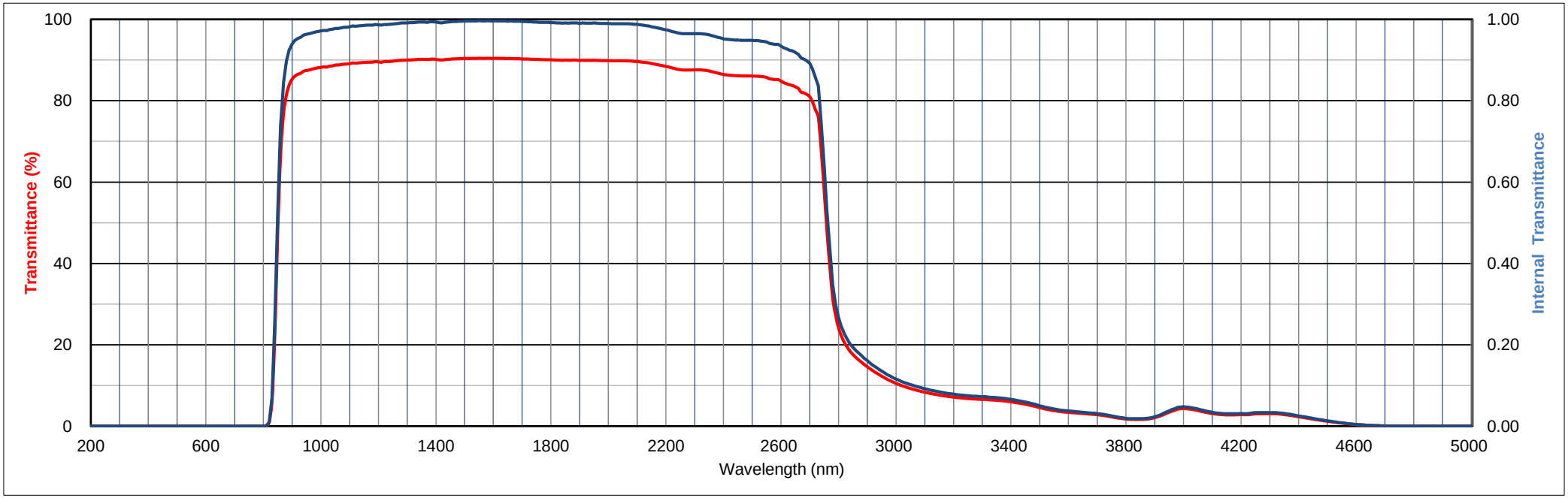
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

W-IR850

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	<1E-05	0.001	0.010	0.069	0.253	0.530	0.738	0.846	0.897	0.925	0.940	0.948	0.953	0.956	0.961	0.963	0.965	0.967	0.969	0.970
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.971	0.973	0.972	0.975	0.976	0.978	0.978	0.979	0.980	0.981	0.982	0.984	0.983	0.984	0.984	0.985	0.986	0.986	0.986	0.987
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.987	0.986	0.987	0.987	0.988	0.989	0.989	0.990	0.991	0.991	0.992	0.992	0.992	0.993	0.993	0.994	0.993	0.993	0.994	0.994
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.993	0.992	0.992	0.993	0.993	0.994	0.995	0.995	0.995	0.995	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.997	0.996
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.995	0.995	0.995	0.994	0.994	0.994	0.994	0.993	0.994	0.993	0.993	0.992	0.993
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.992	0.992	0.991	0.991	0.991	0.992	0.991	0.991	0.992	0.991	0.990	0.991	0.990	0.991	0.991	0.991	0.991	0.990	0.990	0.990
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.990	0.989	0.988	0.982	0.974	0.965	0.965	0.962	0.952	0.949	0.948	0.944	0.934	0.919	0.892	0.642	0.267	0.194	0.161	0.135
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.116	0.102	0.092	0.084	0.079	0.075	0.072	0.070	0.066	0.059	0.050	0.042	0.037	0.034	0.031	0.025	0.019	0.018	0.023	0.038
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.047	0.042	0.034	0.030	0.031	0.033	0.034	0.031	0.025	0.019	0.013	0.008	0.004	0.002	0.001	0.001	0.001	<1E-05	<1E-05	<1E-05
λnm	5000																			
τ	<1E-05																			



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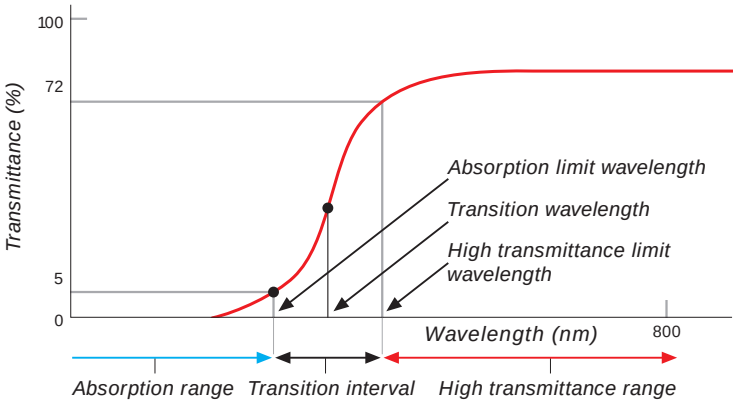
UV Filters (UV Series)

UV28N through UV36N (UV28N, UV30N, UV32N, UV34N, UV36N) are five glass types of ultraviolet filters which absorb the shorter wavelengths of light below a specific wavelength in UV range while transmitting the longer wavelengths of light that are beyond the specific wavelength. The 2-digit value after 'UV' roughly indicates the transmission threshold wavelength. For example, UV28N indicates that the transmission threshold wavelength is approximately 280nm.



HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV28N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.2	2.3	10.2	27.7	50.2	68.3	79.3	84.4	86.7	88.4	88.6	89.3	89.2	89.2	89.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.6	89.6	89.8	89.8	89.7	89.8	89.7	89.9	90.0	90.0	89.9	89.9	90.0	89.8	90.0	90.0	90.1	90.1	90.0	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.0	90.1	90.0	90.0	90.1	90.1	89.9	90.1	90.2	90.2	90.1	90.1	90.2	90.1	89.9	90.1	90.1	90.5	90.5	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	90.5	90.5	90.4	90.5	90.6	90.7	90.9	91.1	91.0	91.1	91.2	91.2	91.3	91.3	91.4	91.5	91.5	91.6	91.6	91.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	91.6	91.7	91.8	91.7	91.8	91.8	91.9	91.9	91.9	91.9	92.0	92.0	92.1	92.1	92.1	92.2				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.536	1.524	1.518	1.514	1.512	1.510	1.509
P	0.914	0.917	0.919	0.920	0.920	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

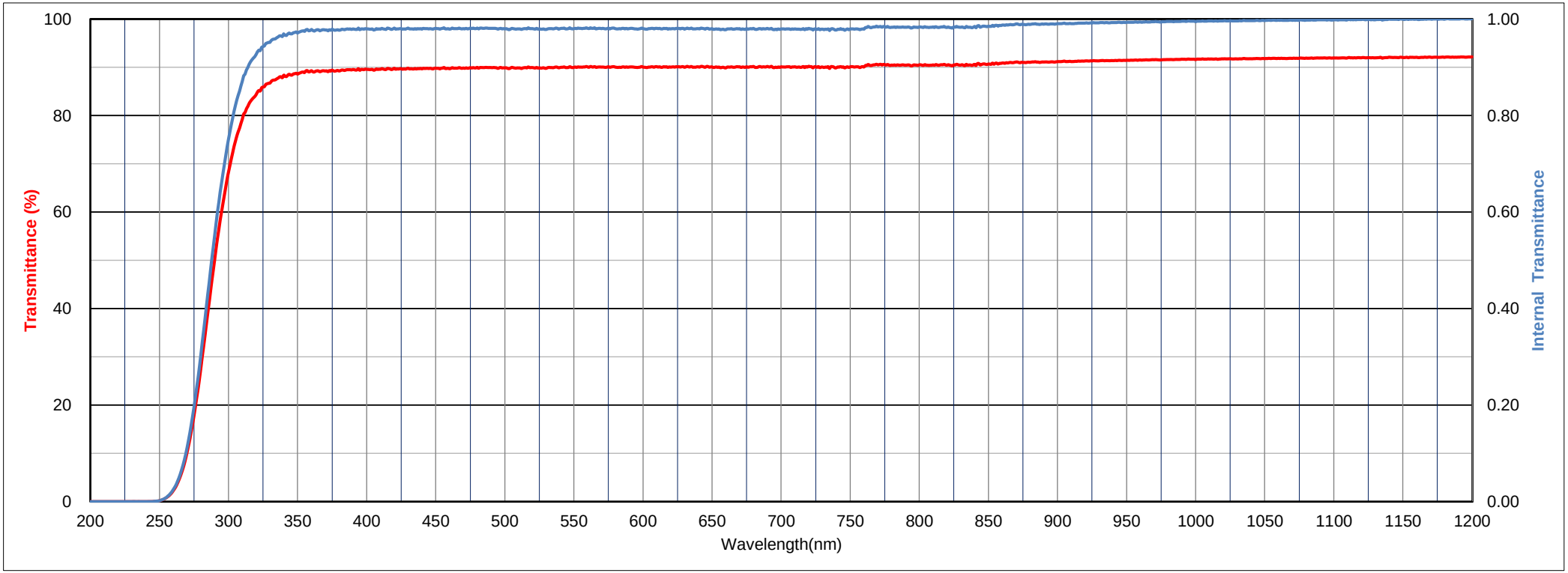
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	572	642	73	87	525	100	2.61

Tolerance of Transmittance (T)

Transition Wavelength	Transition Interval	Average High Transmittance
λ T	Δ λ	Th(%)
280±7 nm	< 45 nm	> 85 %



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HOYA

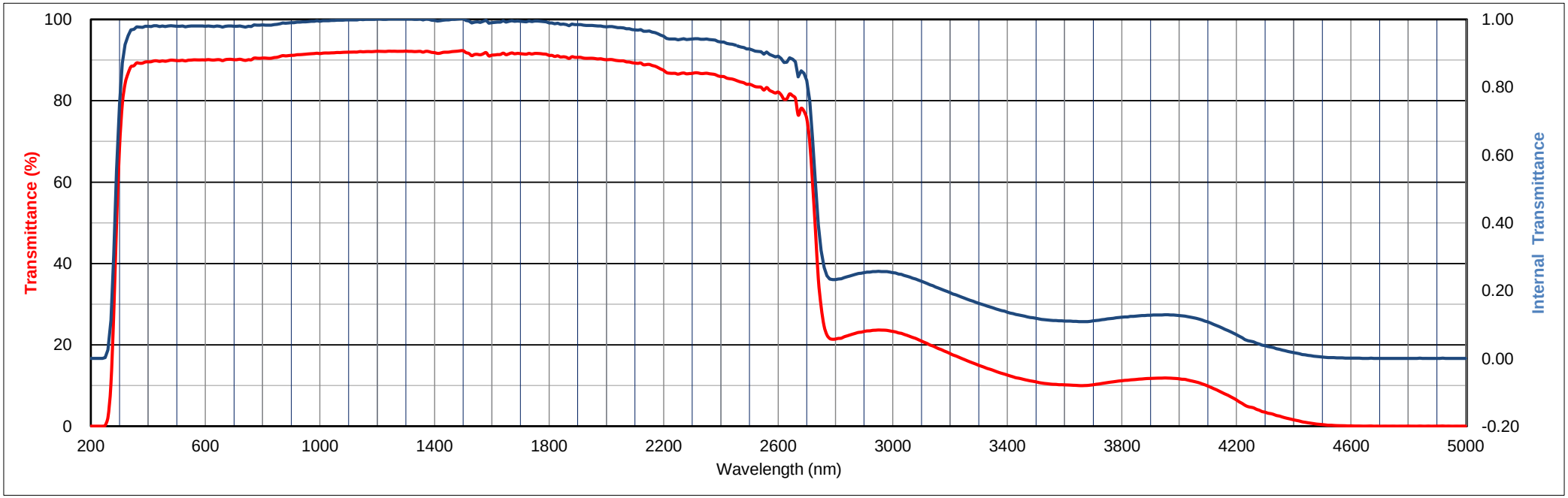
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV28N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.2	2.3	10.2	27.7	50.2	68.3	79.3	84.4	86.7	88.4	88.6	89.3	89.2	89.2	89.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.6	89.6	89.8	89.8	89.7	89.8	89.7	89.9	90.0	90.0	89.9	89.9	90.0	89.8	90.0	90.0	90.1	90.1	90.0	90.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.0	90.1	90.0	90.0	90.1	90.1	89.9	90.1	90.2	90.2	90.1	90.1	90.2	90.1	89.9	90.1	90.1	90.5	90.5	90.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	90.5	90.5	90.4	90.5	90.6	90.7	90.9	91.1	91.0	91.1	91.2	91.2	91.3	91.3	91.4	91.5	91.5	91.6	91.6	91.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	91.6	91.7	91.8	91.7	91.8	91.8	91.9	91.9	91.9	91.9	92.0	92.0	92.0	92.0	92.1	92.0	92.1	92.1	92.1	92.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	92.2	92.2	92.1	92.1	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.2	92.1	92.1	92.2	92.0	92.2	92.1	91.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	91.8	91.7	91.7	91.9	91.9	92.0	92.1	92.1	92.2	92.3	92.3	91.8	91.6	91.1	91.4	91.4	91.3	91.6	91.8	91.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	91.2	91.3	91.4	91.4	91.7	91.3	91.5	91.8	91.6	91.7	91.6	91.5	91.5	91.6	91.5	91.6	91.6	91.6	91.5	91.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	91.2	91.2	90.9	91.0	90.8	90.8	90.7	90.4	90.8	90.7	90.7	90.7	90.5	90.4	90.4	90.5	90.4	90.3	90.3	90.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	90.1	89.8	89.3	88.9	87.5	86.5	86.7	86.8	86.0	85.1	84.1	82.6	82.1	81.2	75.5	29.3	21.4	22.4	23.3	23.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	23.3	22.3	20.9	19.4	17.9	16.4	15.0	13.8	12.6	11.6	10.9	10.4	10.2	10.0	10.2	10.7	11.2	11.5	11.7	11.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	11.7	11.0	9.9	8.3	6.5	4.7	3.5	2.5	1.6	0.8	0.4	0.1	0.1	0.0	-0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV30N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	18.5	59.3	79.6	87.0	89.2	90.3	90.5	90.8	91.0	90.9	91.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	91.1	91.3	91.4	91.4	91.5	91.3	91.5	91.5	91.6	91.5	91.7	91.7	91.8	91.8	91.8	92.0	91.9	92.0	92.0	92.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	92.2	92.2	92.3	92.4	92.4	92.4	92.6	92.6	92.6	92.7	92.8	92.9	92.9	93.1	93.0	93.0	93.2	92.4	92.3	92.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	92.3	92.4	92.4	92.5	92.5	92.5	92.8	92.5	92.5	92.5	92.6	92.7	92.7	92.8	92.8	92.8	92.9	93.0	92.9	93.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	93.1	93.1	93.1	93.1	93.1	93.2	93.2	93.2	93.2	93.3	93.3	93.3	93.4	93.5	93.4	93.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.524	1.509	1.501	1.497	1.494	1.492	1.491
P	0.917	0.921	0.923	0.924	0.925	0.925	0.925

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

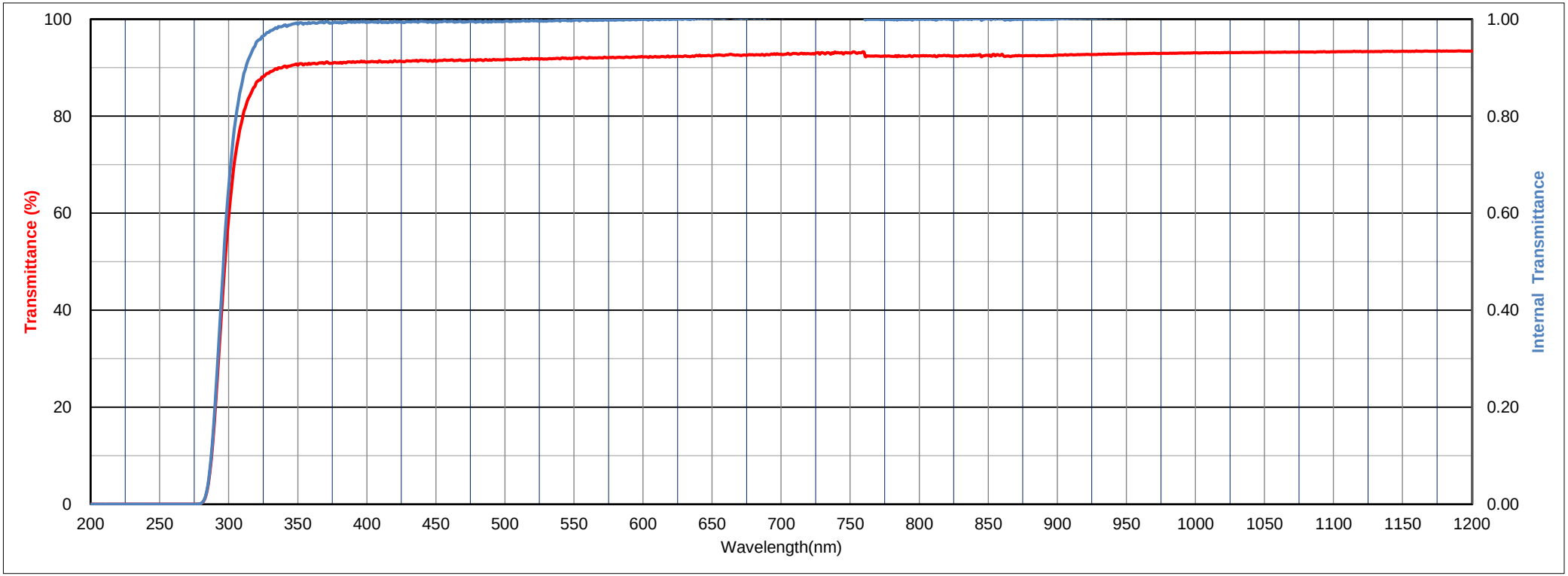
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	533	622	60	65	515	80	2.50

Tolerance of Transmittance (T)

Transition Wavelength	Transition Interval	Average High Transmittance
λ T	Δ λ	Th(%)
300±7 nm	< 40 nm	> 85 %



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HOYA

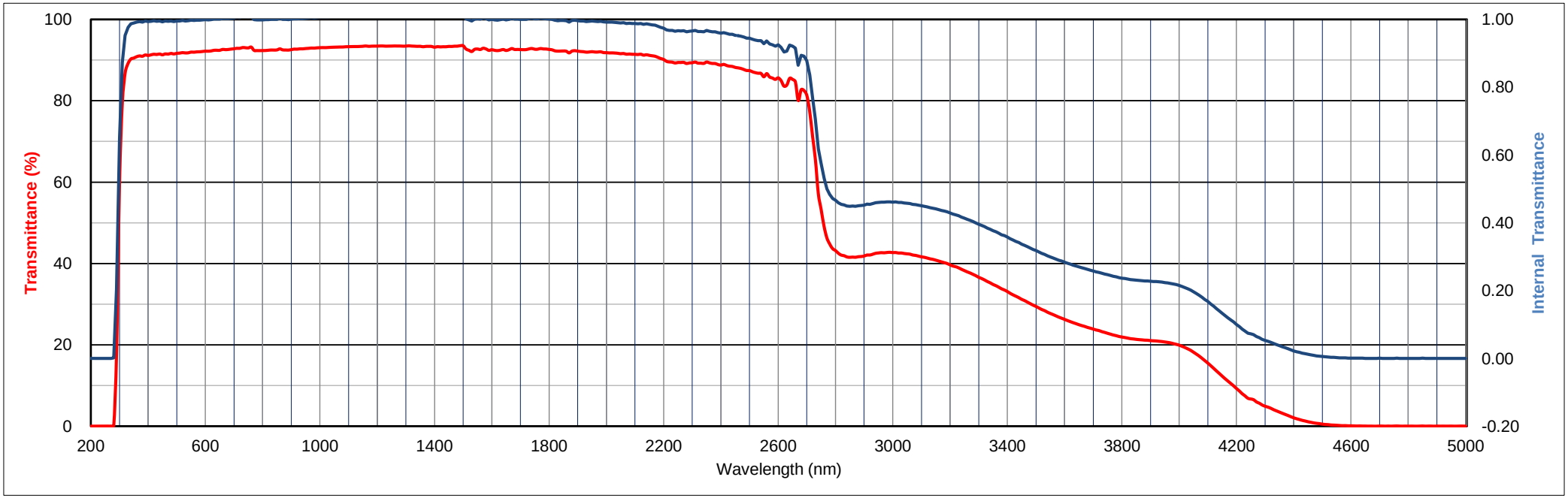
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV30N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	18.5	59.3	79.6	87.0	89.2	90.3	90.5	90.8	91.0	90.9	91.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	91.1	91.3	91.4	91.4	91.5	91.3	91.5	91.5	91.6	91.5	91.7	91.7	91.8	91.8	91.8	92.0	91.9	92.0	92.0	92.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	92.2	92.2	92.3	92.4	92.4	92.4	92.6	92.6	92.6	92.7	92.8	92.9	92.9	93.1	93.0	93.0	93.2	92.4	92.3	92.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	92.3	92.4	92.4	92.5	92.5	92.5	92.8	92.5	92.5	92.5	92.6	92.7	92.7	92.8	92.8	92.8	92.9	93.0	92.9	93.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	93.1	93.1	93.1	93.1	93.1	93.2	93.2	93.2	93.2	93.3	93.3	93.3	93.3	93.3	93.4	93.4	93.5	93.4	93.4	93.4
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	93.4	93.5	93.5	93.4	93.4	93.5	93.5	93.5	93.5	93.4	93.4	93.5	93.5	93.4	93.4	93.4	93.3	93.4	93.4	93.4
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	93.2	93.3	93.2	93.3	93.3	93.4	93.4	93.4	93.4	93.5	93.5	92.7	92.4	92.1	92.6	92.7	92.6	92.9	92.7	92.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	92.6	92.4	92.3	92.4	92.6	92.4	92.6	92.8	92.6	92.6	92.6	92.6	92.6	92.7	92.9	92.7	92.7	92.8	92.7	92.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	92.6	92.5	92.3	92.2	92.2	92.2	92.2	91.8	92.2	92.3	92.2	92.1	92.1	92.0	92.0	92.1	92.0	92.0	92.0	91.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	91.8	91.6	91.4	91.2	90.2	89.4	89.3	89.5	88.8	88.2	87.4	85.9	85.6	85.3	81.3	53.2	43.2	41.5	41.8	42.6
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	42.7	42.4	41.6	40.8	39.7	38.3	36.6	34.8	33.1	31.2	29.4	27.7	26.3	25.0	23.9	22.8	21.9	21.4	21.0	20.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	19.9	18.2	15.5	12.3	9.3	6.7	4.9	3.5	2.1	1.1	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV32N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.5	32.5	57.8	72.6	81.0	84.9	87.1	88.1	88.3	89.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.2	89.4	89.5	89.6	89.5	89.7	89.7	89.8	89.9	89.9	89.9	90.0	90.1	90.0	90.2	90.3	90.3	90.3	90.3	90.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.3	90.4	90.4	90.4	90.6	90.5	90.3	90.5	90.5	90.6	90.6	90.6	90.8	90.7	90.6	90.7	90.7	90.7	90.9	90.7
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	90.8	90.7	90.7	90.6	90.8	90.9	90.7	90.7	90.6	90.6	90.8	90.9	91.0	91.0	91.1	91.1	91.1	91.2	91.2	91.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	91.2	91.3	91.4	91.4	91.4	91.4	91.5	91.5	91.5	91.6	91.6	91.7	91.7	91.8	91.8	91.8				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.600	1.586	1.579	1.574	1.571	1.570	1.568
P	0.899	0.902	0.904	0.905	0.906	0.906	0.907

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

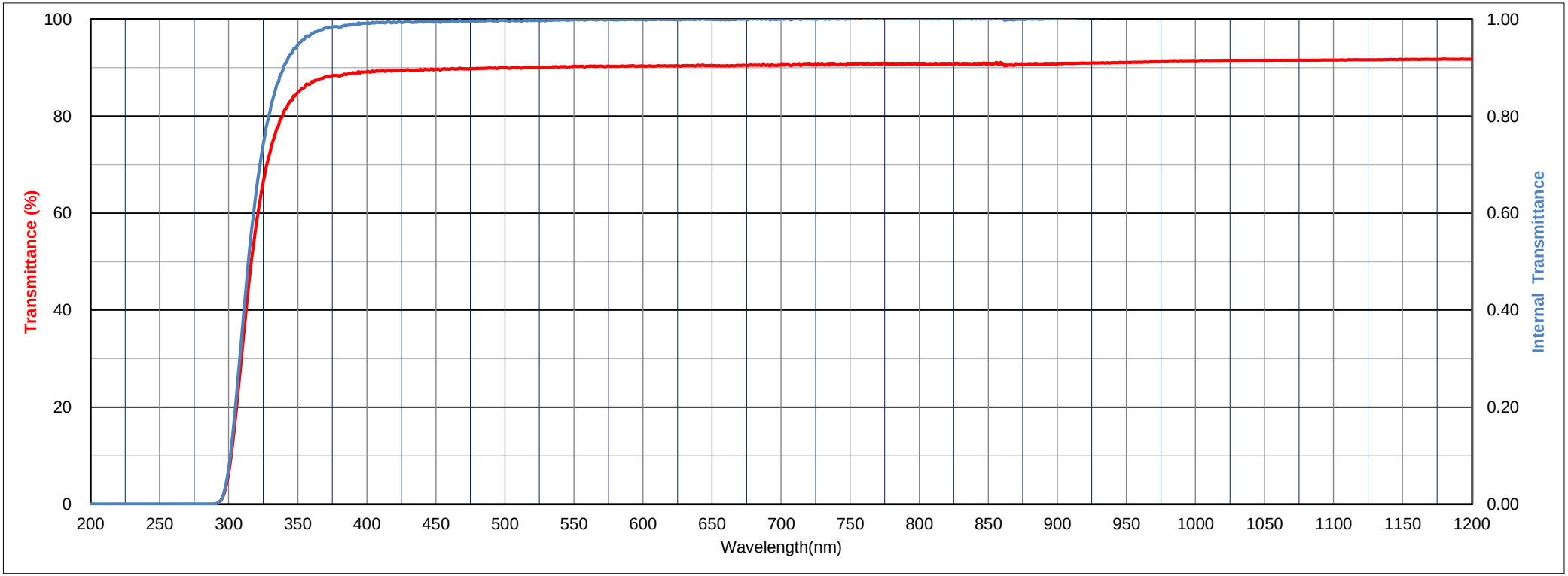
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	2	572	630	69	83	495	130	3.23

Tolerance of Transmittance (T)

Transition Wavelength	Transition Interval	Average High Transmittance
λ T	Δ λ	Th(%)
320±7 nm	< 40 nm	> 85 %



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The content of this catalog is accurate as of October ,2020

HOYA

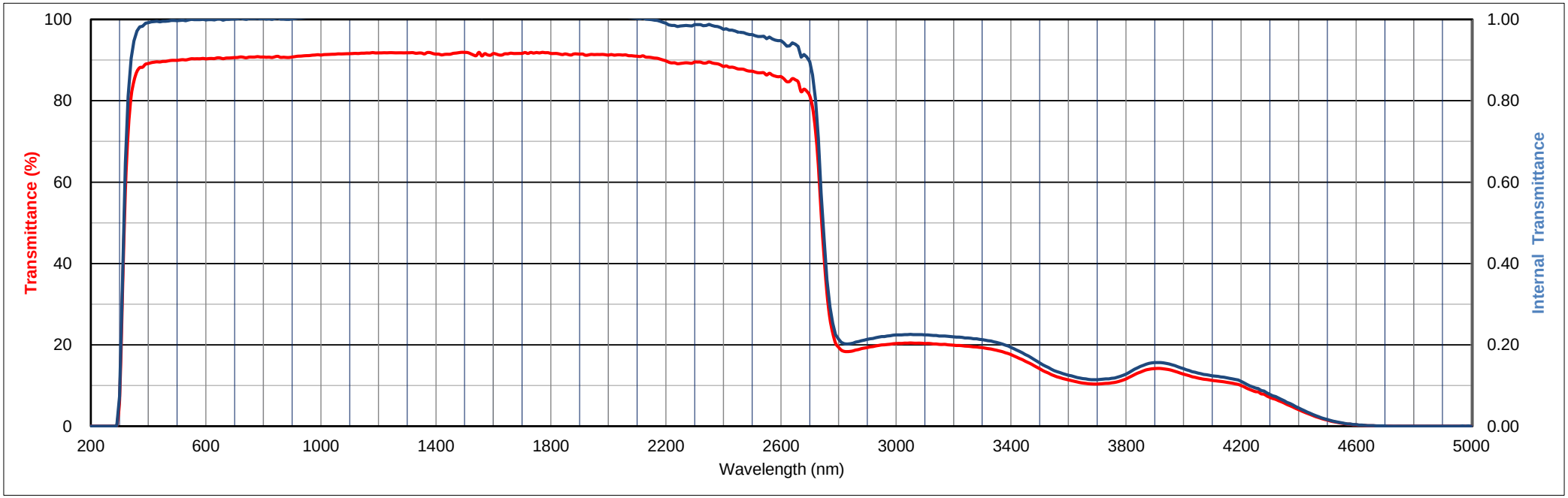
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV32N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	6.5	32.5	57.8	72.6	81.0	84.9	87.1	88.1	88.3	89.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.2	89.4	89.5	89.6	89.5	89.7	89.7	89.8	89.9	89.9	89.9	90.0	90.1	90.0	90.2	90.3	90.3	90.3	90.3	90.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.3	90.4	90.4	90.4	90.6	90.5	90.3	90.5	90.5	90.6	90.6	90.6	90.8	90.7	90.6	90.7	90.7	90.7	90.9	90.7
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	90.8	90.7	90.7	90.6	90.8	90.9	90.7	90.7	90.6	90.6	90.8	90.9	91.0	91.0	91.1	91.1	91.1	91.2	91.2	91.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	91.2	91.3	91.4	91.4	91.4	91.4	91.5	91.5	91.5	91.6	91.6	91.6	91.7	91.6	91.7	91.7	91.8	91.7	91.8	91.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.8	91.7	91.7	91.7	91.5	91.9	91.8	91.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	91.5	91.5	91.3	91.4	91.4	91.4	91.7	91.7	91.8	91.9	91.9	91.9	91.6	91.3	91.1	91.9	91.0	91.6	91.3	91.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	91.6	91.5	91.2	91.3	91.6	91.5	91.7	91.6	91.6	91.6	91.7	91.9	91.6	91.9	91.7	91.9	91.8	91.9	91.8	91.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	91.6	91.6	91.6	91.5	91.4	91.5	91.4	91.2	91.5	91.5	91.5	91.5	91.2	91.3	91.4	91.3	91.4	91.4	91.4	91.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	91.2	91.2	91.0	90.6	89.8	89.2	89.5	89.5	88.4	87.8	87.3	86.3	85.9	85.2	81.2	41.6	19.4	18.5	19.3	20.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	20.3	20.5	20.3	20.1	19.9	19.7	19.3	18.7	17.6	16.0	14.1	12.4	11.4	10.6	10.4	10.7	11.6	13.3	14.2	13.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	12.8	11.8	11.3	10.8	10.0	8.5	7.1	5.7	4.1	2.6	1.5	0.7	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV34N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	14.4	43.4	62.8	73.1	78.8	81.8	83.9
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.2	85.8	86.1	86.3	86.4	86.5	86.7	86.7	87.1	87.1	87.3	87.5	87.6	87.6	87.8	87.9	87.9	88.0	87.9	87.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	87.9	87.9	87.8	88.0	87.8	87.8	87.9	87.9	88.0	88.1	88.2	88.3	88.3	88.5	88.5	88.6	88.6	88.7	88.6	88.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.7	88.5	88.6	88.7	88.6	88.6	88.6	88.6	88.6	88.5	88.6	88.8	88.9	88.9	89.0	89.1	89.2	89.2	89.2	89.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.4	89.4	89.4	89.4	89.5	89.5	89.6	89.6	89.6	89.7	89.6	89.7	89.7	89.8	89.8	89.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.704	1.678	1.665	1.657	1.652	1.649	1.647
P	0.873	0.880	0.883	0.885	0.886	0.887	0.887

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

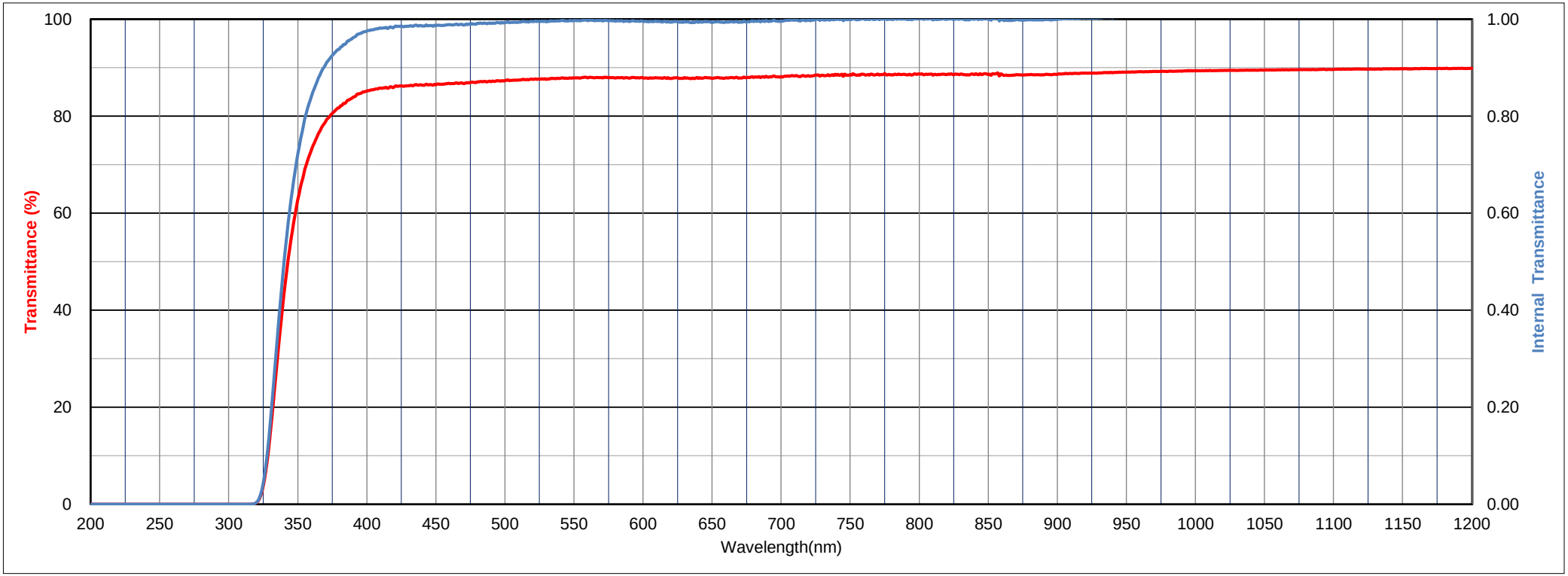
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	447	490	79	91	415	150	4.01

Tolerance of Transmittance (T)

Transition Wavelength	Transition Interval	Average High Transmittance
λ T	Δ λ	Th(%)
340±7 nm	< 40 nm	> 85 %



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

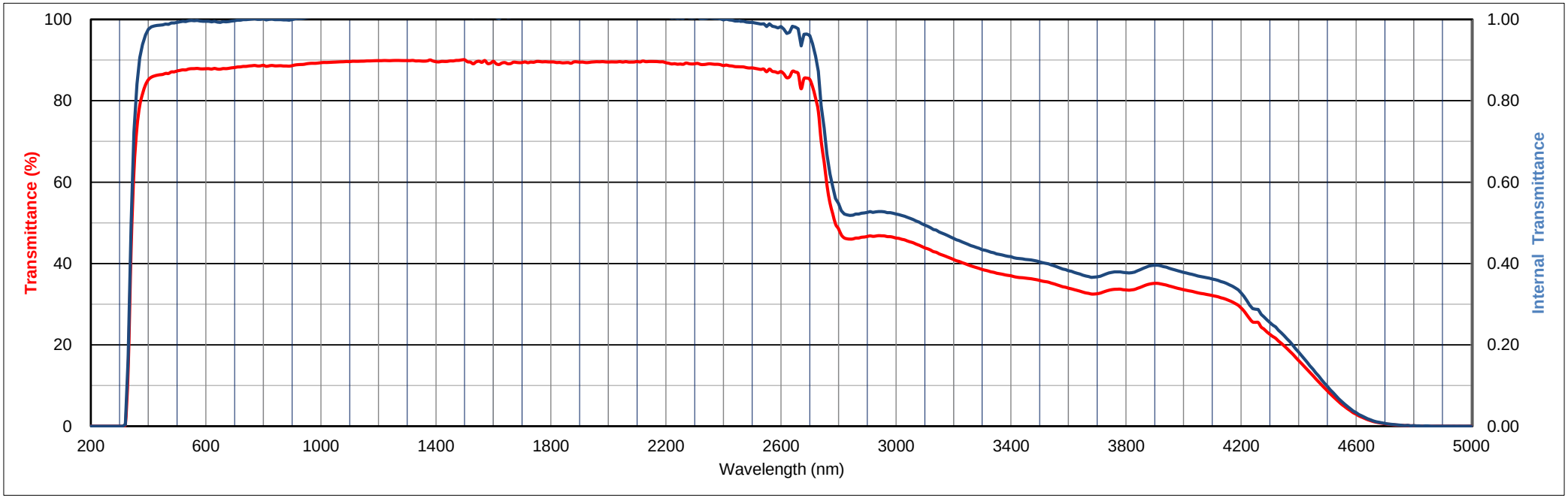
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV34N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	14.4	43.4	62.8	73.1	78.8	81.8	83.9
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.2	85.8	86.1	86.3	86.4	86.5	86.7	86.7	87.1	87.1	87.3	87.5	87.6	87.6	87.8	87.9	87.9	88.0	87.9	87.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	87.9	87.9	87.8	88.0	87.8	87.8	87.9	87.9	88.0	88.1	88.2	88.3	88.3	88.5	88.5	88.6	88.6	88.7	88.6	88.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.7	88.5	88.6	88.7	88.6	88.6	88.6	88.6	88.6	88.5	88.6	88.8	88.9	88.9	89.0	89.1	89.2	89.2	89.2	89.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.4	89.4	89.4	89.4	89.5	89.5	89.6	89.6	89.6	89.7	89.6	89.7	89.7	89.7	89.7	89.7	89.8	89.8	89.8	89.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.9	89.8	89.8	89.8	89.7	89.8	90.0	89.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.6	89.6	89.7	89.7	89.7	89.8	89.8	89.9	89.9	90.1	90.1	89.6	89.5	89.1	89.6	89.7	89.4	89.9	89.2	89.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.7	89.1	88.9	89.3	89.4	89.1	89.1	89.5	89.4	89.4	89.4	89.5	89.4	89.5	89.5	89.7	89.7	89.6	89.6	89.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.5	89.5	89.4	89.4	89.3	89.4	89.4	89.2	89.6	89.6	89.5	89.5	89.4	89.4	89.5	89.6	89.6	89.6	89.6	89.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.5	89.5	89.6	89.7	89.3	89.0	89.1	89.1	88.7	88.4	88.1	87.1	87.2	87.1	85.3	65.0	48.6	46.0	46.6	46.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	46.3	45.3	43.8	42.4	41.0	39.7	38.5	37.6	37.0	36.4	35.8	35.0	33.9	33.0	32.6	33.6	33.5	34.1	35.1	34.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	33.6	32.8	32.1	31.1	29.1	25.5	22.6	19.7	16.2	12.4	8.7	5.4	3.0	1.4	0.6	0.2	0.1	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV36N

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	33.3	68.3	81.6	86.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	88.2	89.0	89.5	89.8	90.0	90.1	90.1	90.3	90.3	90.4	90.4	90.5	90.7	90.5	90.7	90.8	90.8	90.9	90.9	90.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.9	91.0	91.1	91.0	91.2	91.2	91.3	91.4	91.4	91.6	91.6	91.6	91.8	91.7	91.9	92.0	91.9	91.4	91.3	91.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	91.5	91.5	91.3	91.4	91.6	91.4	91.5	91.7	91.7	91.7	91.7	91.8	91.9	91.9	92.0	92.1	92.1	92.1	92.2	92.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	92.2	92.3	92.3	92.3	92.3	92.4	92.4	92.5	92.5	92.5	92.5	92.6	92.6	92.6	92.6	92.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.532	1.521	1.515	1.512	1.510	1.508	1.507
P	0.915	0.918	0.919	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

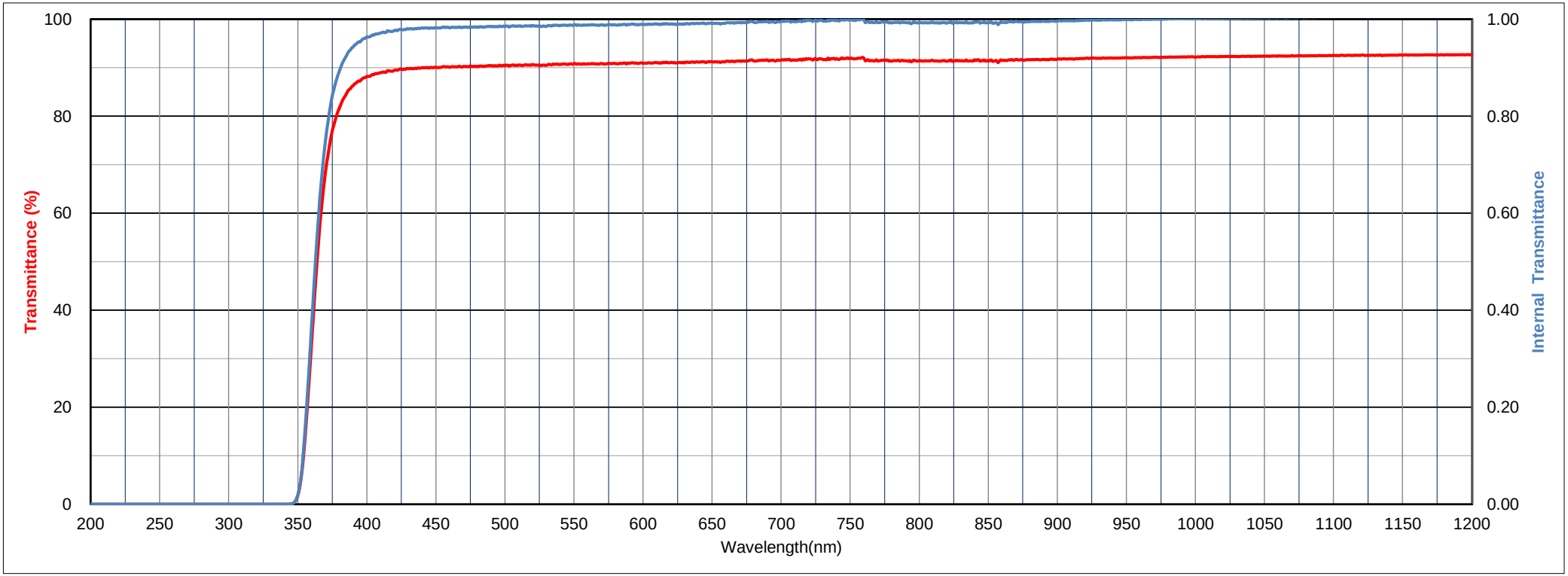
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	2	587	646	69	84	600	90	2.52

Tolerance of Transmittance (T)

Transition Wavelength	Transition Interval	Average High Transmittance
λ T	Δ λ	Th(%)
360±7 nm	< 40 nm	> 85 %



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The content of this catalog is accurate as of October ,2020

HOYA

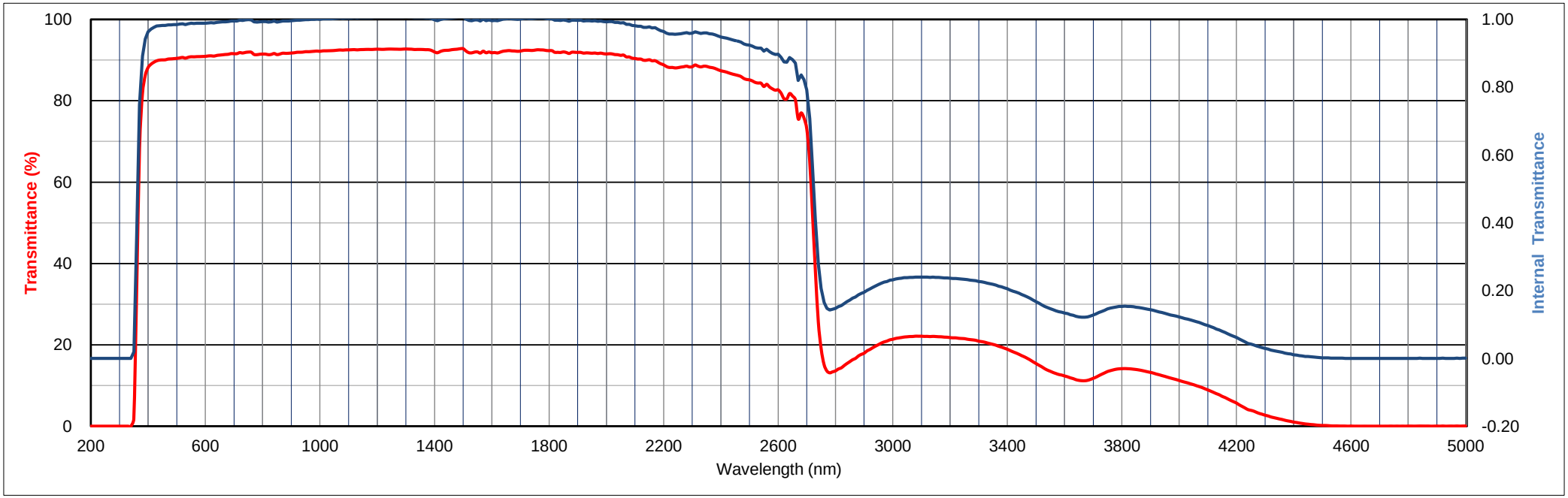
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UV36N

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	33.3	68.3	81.6	86.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	88.2	89.0	89.5	89.8	90.0	90.1	90.1	90.3	90.3	90.4	90.4	90.5	90.7	90.5	90.7	90.8	90.8	90.9	90.9	90.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	90.9	91.0	91.1	91.0	91.2	91.2	91.3	91.4	91.4	91.6	91.6	91.6	91.8	91.7	91.9	92.0	91.9	91.4	91.3	91.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	91.5	91.5	91.3	91.4	91.6	91.4	91.5	91.7	91.7	91.7	91.7	91.8	91.9	91.9	92.0	92.1	92.1	92.1	92.2	92.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	92.2	92.3	92.3	92.3	92.3	92.4	92.4	92.5	92.5	92.5	92.5	92.6	92.6	92.5	92.6	92.6	92.6	92.6	92.6	92.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	92.7	92.7	92.6	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.6	92.6	92.6	92.6	92.6	92.6	92.4
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	92.0	91.8	92.1	92.3	92.4	92.4	92.6	92.6	92.7	92.8	92.8	92.2	91.8	91.8	92.0	92.0	91.7	92.2	91.8	92.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	91.8	91.9	91.8	92.0	92.2	92.3	92.3	92.3	92.2	92.2	92.2	92.4	92.4	92.4	92.4	92.4	92.5	92.5	92.5	92.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	92.3	92.3	91.9	91.9	91.9	92.0	91.9	91.6	91.9	91.9	91.9	91.9	91.7	91.8	91.7	91.7	91.7	91.6	91.7	91.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	91.5	91.2	90.4	90.1	88.8	88.1	88.4	88.5	87.4	86.4	85.1	83.5	82.7	81.2	73.0	19.0	13.6	15.9	17.9	20.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	21.4	22.0	22.1	22.0	21.8	21.5	20.9	20.1	18.9	17.3	15.4	13.5	12.3	11.3	11.8	13.4	14.1	13.9	13.2	12.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	11.2	10.2	8.9	7.3	5.7	3.9	2.7	1.8	1.0	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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Blue Filters

Blue filters transmit a relatively narrow band within the blue wavelength region.
The 3-digit value after a capital letter indicates the wavelength of maximum transmittance. For example, E-B390 indicates that the transmittance is maximum when the wavelength is approximately 390 nm.
This filter type features the band-pass function in the vicinity of the ultraviolet region and also has absorption features in other wavelengths.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B370

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7.4	26.6	46.9	62.3	71.8	78.0	81.3	81.8	81.2	77.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	67.4	56.5	43.5	30.1	18.9	9.3	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	5.2	25.3	51.8	71.0	81.1	85.4	87.0	87.5	87.3	87.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	86.6	86.1	85.5	84.9	84.2	83.4	82.5	81.6	80.6	79.5	78.3	77.0	75.5	73.8	71.9	69.8	67.4	64.6	61.5	58.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	54.0	49.9	45.3	40.6	35.9	31.0	26.2	22.0	17.9	14.3	11.1	6.4	3.5	1.8	1.0	0.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.541	1.533	1.528	1.526	1.524	1.522	1.521
P	0.913	0.915	0.916	0.917	0.917	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

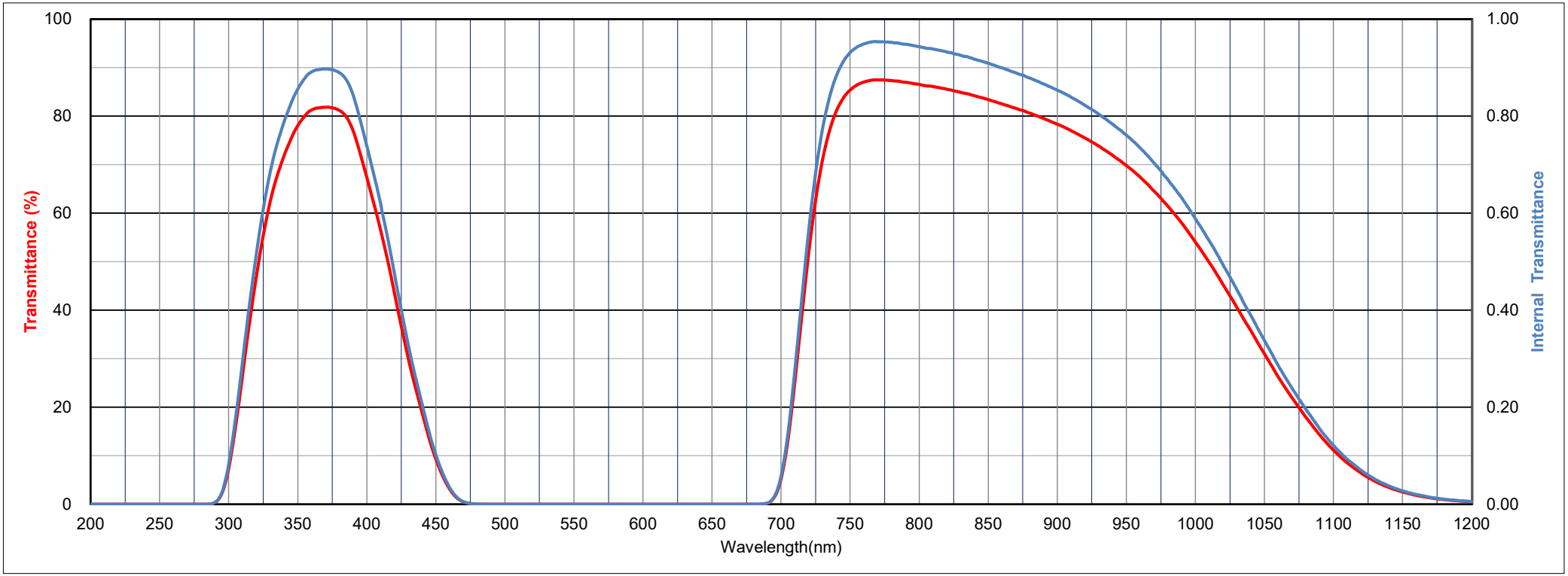
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	515	565	-	102	540	110	2.62

Tolerance of Transmittance (T)

Maximum Transmittance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
82±3	>290	<480



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HOYA

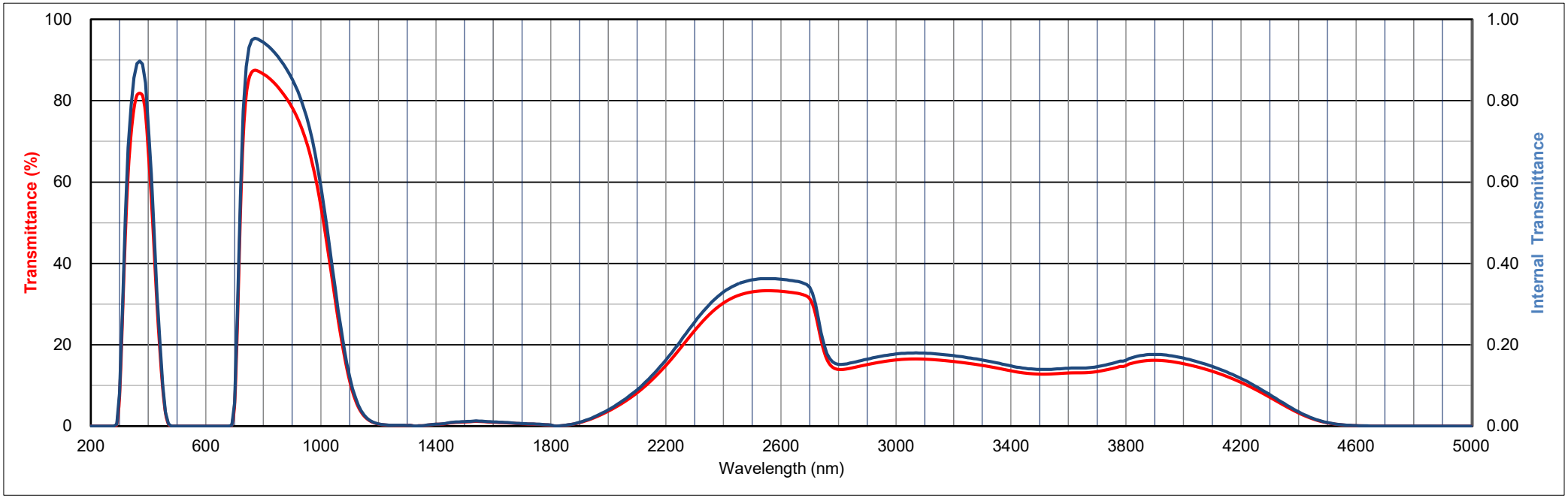
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B370

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	7.4	26.6	46.9	62.3	71.8	78.0	81.3	81.8	81.2	77.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	67.4	56.5	43.5	30.1	18.9	9.3	3.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	5.2	25.3	51.8	71.0	81.1	85.4	87.0	87.5	87.3	87.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	86.6	86.1	85.5	84.9	84.2	83.4	82.5	81.6	80.6	79.5	78.3	77.0	75.5	73.8	71.9	69.8	67.4	64.6	61.5	58.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	54.0	49.9	45.3	40.6	35.9	31.0	26.2	22.0	17.9	14.3	11.1	8.5	6.4	4.7	3.5	2.5	1.8	1.3	1.0	0.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.1	0.2	0.3	0.4
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.4	0.5	0.5	0.6	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.1	1.1	1.0	1.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.2	0.1	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.1	1.3	1.5	1.8	2.0	2.4	2.7	3.0	3.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	3.7	5.7	8.2	11.3	14.9	19.1	23.5	27.4	30.3	32.1	33.0	33.3	33.2	32.7	31.3	18.3	13.9	14.4	15.1	15.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	16.3	16.5	16.5	16.2	15.9	15.5	14.9	14.3	13.6	13.0	12.8	12.9	13.1	13.1	13.4	14.1	14.9	15.9	16.2	15.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	15.3	14.5	13.5	12.2	10.7	9.0	7.1	5.1	3.2	1.8	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

E-B390

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.6	21.8	41.6	57.3	67.2	72.8	76.3	78.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	77.5	75.4	72.3	67.3	61.4	52.9	41.9	26.2	12.4	4.6	1.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.3	3.5	3.9	3.9	3.8	3.6	3.5	3.4	3.3	3.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	3.3	3.4	3.4	3.5	3.6	3.7	3.9	4.1	4.3	4.5	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.3	7.8	8.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	8.6	9.0	9.3	9.7	9.9	10.1	10.3	10.3	10.2	10.1	9.8	9.1	8.0	6.8	5.6	4.6				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.528	1.519	1.514	1.512	1.510	1.509	1.508
P	0.916	0.919	0.920	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

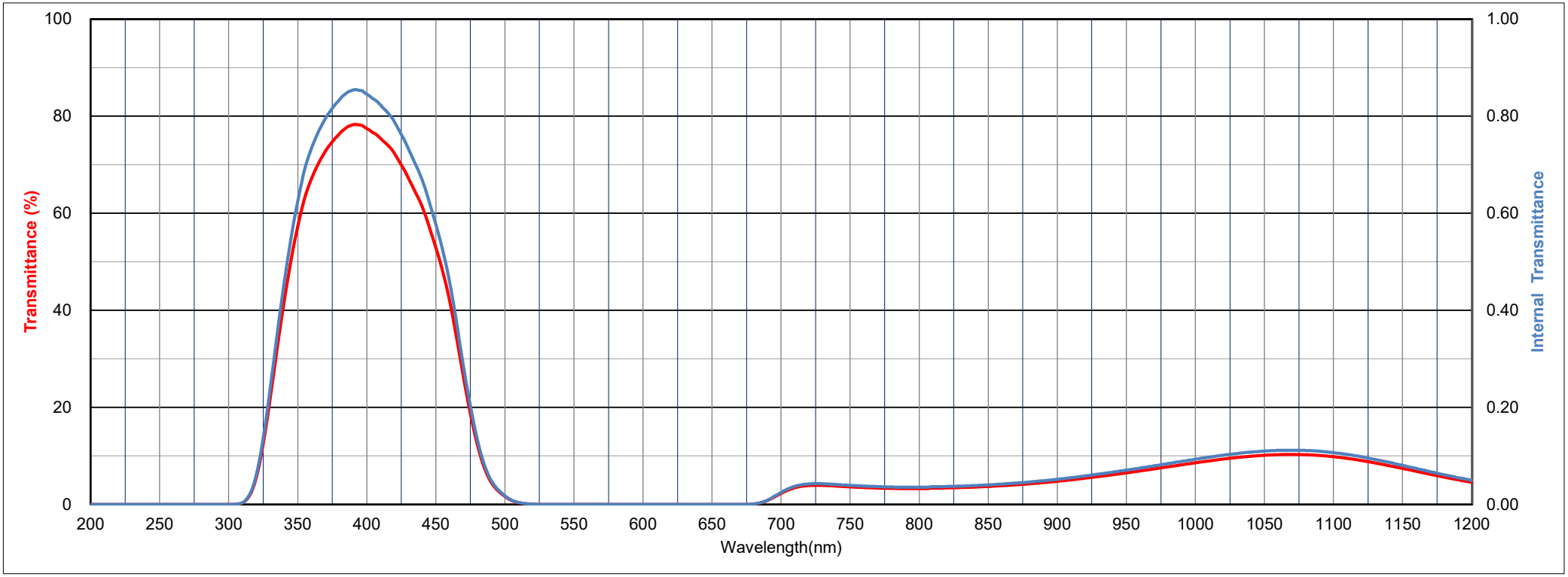
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	0.156	0.023	1	452	99
D65	0.155	0.024	1	453	99

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	485	535	92	104	510	110	2.57

Tolerance of Transmittance (T)

Maximum Transmittance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
78±3	>310	<510



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HOYA

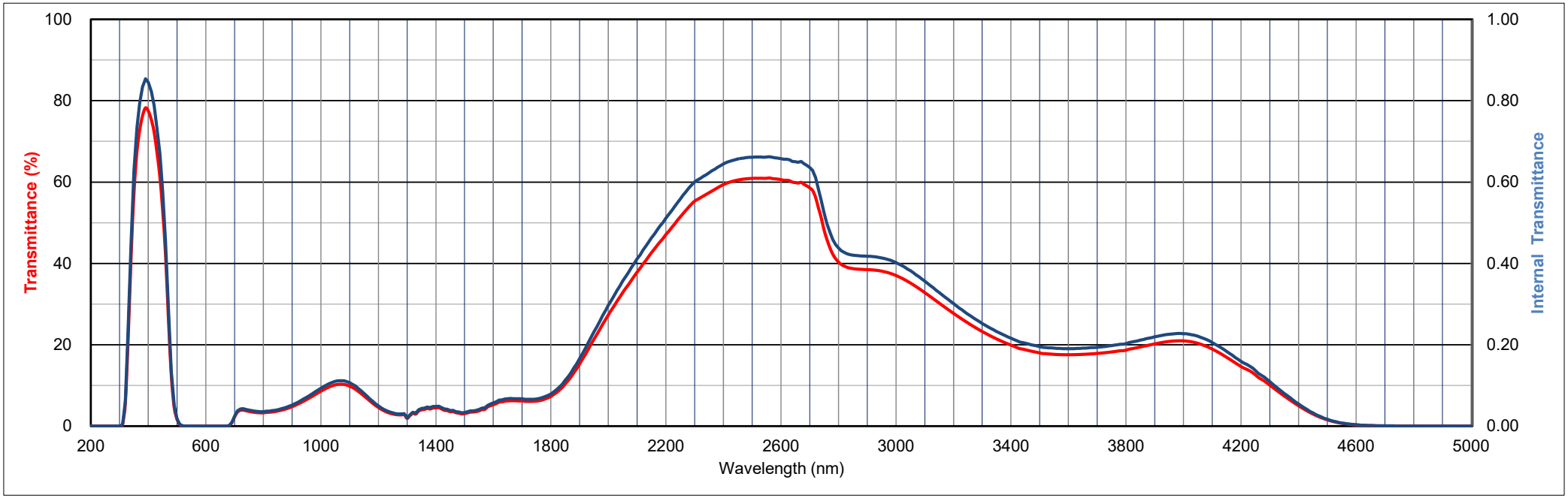
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

E-B390

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.6	21.8	41.6	57.3	67.2	72.8	76.3	78.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	77.5	75.4	72.3	67.3	61.4	52.9	41.9	26.2	12.4	4.6	1.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	2.3	3.5	3.9	3.9	3.8	3.6	3.5	3.4	3.3	3.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	3.3	3.4	3.4	3.5	3.6	3.7	3.9	4.1	4.3	4.5	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.3	7.8	8.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	8.6	9.0	9.3	9.7	9.9	10.1	10.3	10.3	10.2	10.1	9.8	9.5	9.1	8.6	8.0	7.4	6.8	6.2	5.6	5.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	4.6	4.1	3.8	3.4	3.2	3.0	2.8	2.8	2.8	2.8	1.9	2.6	3.1	3.0	3.7	4.0	4.1	4.3	4.2	4.5
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	4.5	4.5	4.2	3.9	3.8	3.5	3.6	3.3	3.2	3.0	3.1	3.2	3.4	3.5	3.6	3.7	4.1	4.1	4.7	5.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	5.3	5.5	5.9	6.0	6.1	6.2	6.2	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.3	6.4	6.7	7.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	7.3	7.8	8.3	8.9	9.5	10.4	11.2	12.1	13.2	14.1	15.3	16.5	17.6	18.9	20.2	21.4	22.6	23.8	25.0	26.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	27.4	32.9	37.9	42.7	47.1	51.4	55.3	57.4	59.4	60.5	60.9	60.9	60.6	59.9	58.6	48.2	40.4	38.7	38.5	38.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	37.0	35.2	32.8	30.3	27.7	25.4	23.3	21.4	19.9	18.8	18.0	17.6	17.6	17.6	17.9	18.2	18.7	19.5	20.2	20.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.0	20.4	18.9	16.9	14.7	12.6	10.1	7.4	5.0	3.0	1.5	0.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B410

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	1.3	7.8	17.5	29.3	43.1	57.1	68.7	77.3	83.2	86.9	89.3	90.8	91.5	92.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	91.9	91.8	91.5	90.9	89.7	88.6	87.5	85.3	81.7	76.8	70.7	63.6	55.5	47.0	38.9	29.9	21.5	15.1	10.5	7.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	4.1	1.7	1.0	0.9	1.0	0.8	0.4	0.5	0.6	0.7	1.2	4.3	13.8	29.5	50.3	72.4	85.1	89.9	91.3	91.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	91.9	91.9	91.9	91.9	91.9	91.8	91.7	91.7	91.6	91.5	91.5	91.4	91.3	91.1	91.0	90.8	90.7	90.5	90.3	90.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.8	89.5	89.3	89.0	88.6	88.4	88.0	87.5	87.3	86.8	86.3	85.3	84.2	83.1	81.7	80.2				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.486	1.473	1.467	1.463	1.460	1.459	1.457
P	0.926	0.929	0.931	0.932	0.932	0.933	0.933

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

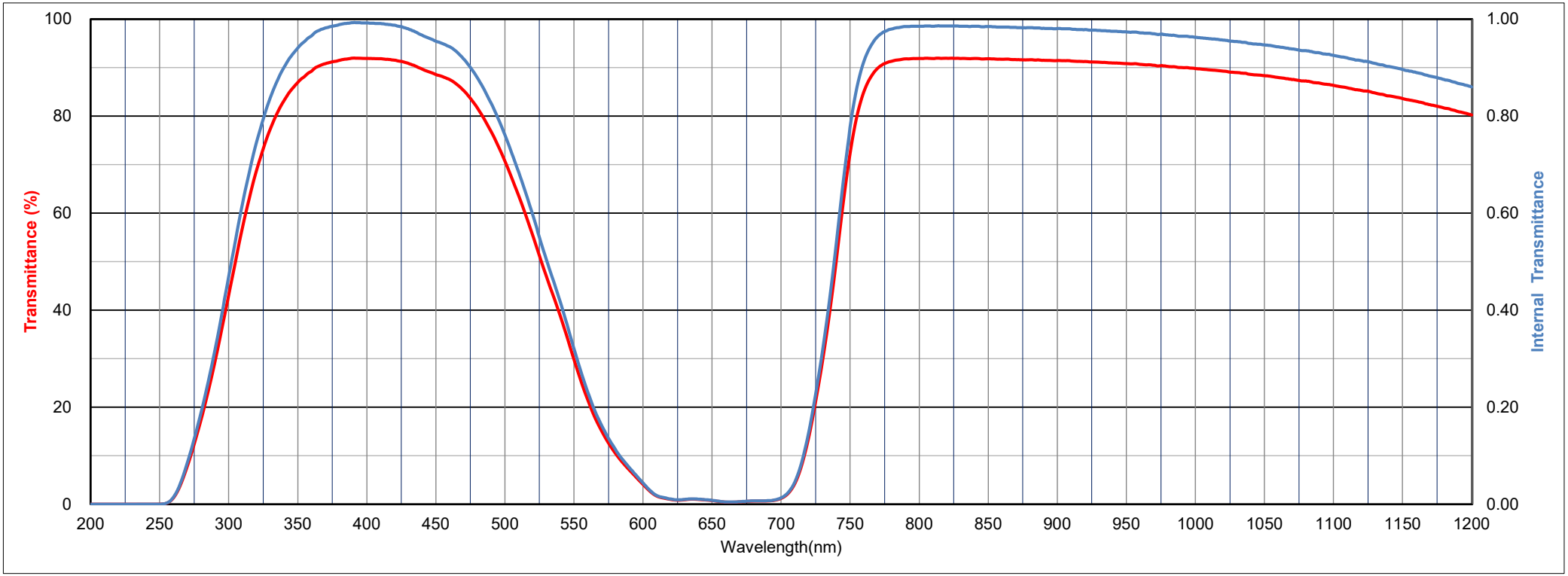
	x	y	Y	λ_d	P_e
A	0.198	0.339	22	490	62
C	0.162	0.190	30	480	68
D65	0.162	0.205	30	481	67

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	4	410	500	70	79	420	120	2.27

Tolerance of Transmittance (T)

Maximum Transmitance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
90±3	>250	<600



All data is mean values of various melts.

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HOYA

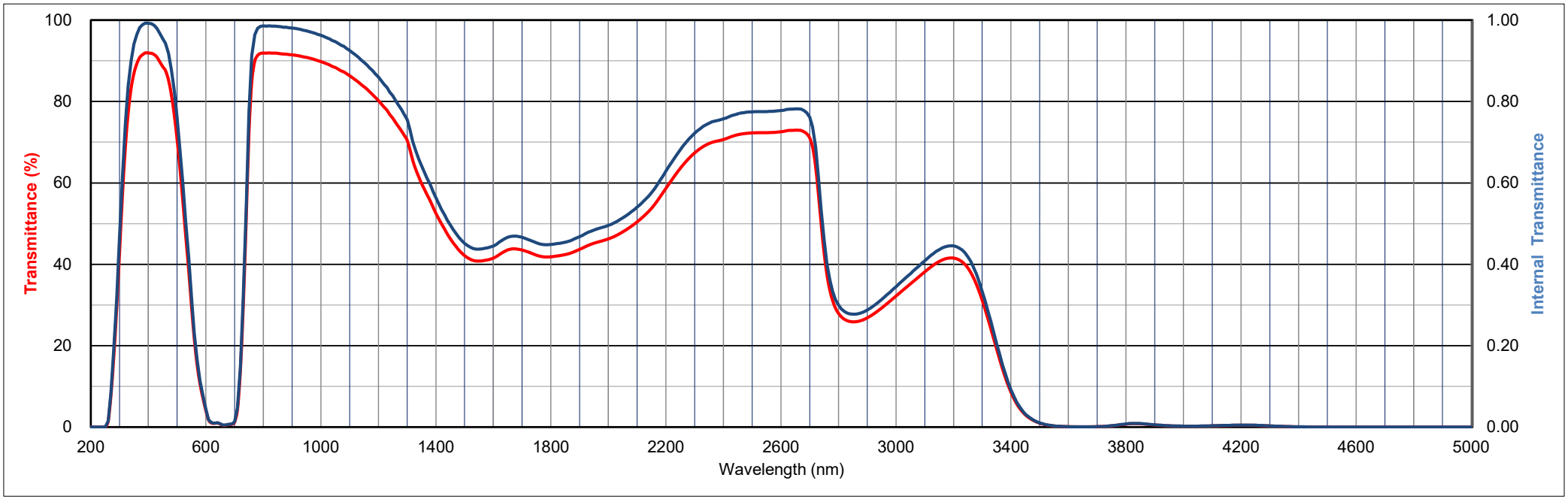
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B410

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	1.3	7.8	17.5	29.3	43.1	57.1	68.7	77.3	83.2	86.9	89.3	90.8	91.5	92.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	91.9	91.8	91.5	90.9	89.7	88.6	87.5	85.3	81.7	76.8	70.7	63.6	55.5	47.0	38.9	29.9	21.5	15.1	10.5	7.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	4.1	1.7	1.0	0.9	1.0	0.8	0.4	0.5	0.6	0.7	1.2	4.3	13.8	29.5	50.3	72.4	85.1	89.9	91.3	91.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	91.9	91.9	91.9	91.9	91.9	91.8	91.7	91.7	91.6	91.5	91.5	91.4	91.3	91.1	91.0	90.8	90.7	90.5	90.3	90.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.8	89.5	89.3	89.0	88.6	88.4	88.0	87.5	87.3	86.8	86.3	85.8	85.3	84.8	84.2	83.6	83.1	82.4	81.7	81.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	80.2	79.4	78.6	77.8	76.8	75.9	74.8	73.8	72.8	71.7	70.5	68.1	65.4	63.3	61.6	59.9	58.5	57.0	55.6	54.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	52.5	51.2	49.9	48.7	47.4	46.3	45.3	44.4	43.5	42.8	42.1	41.6	41.2	41.0	40.8	40.8	40.8	41.0	41.1	41.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	41.5	41.9	42.4	42.8	43.2	43.5	43.7	43.8	43.8	43.7	43.5	43.3	43.0	42.8	42.5	42.2	42.0	41.9	41.8	41.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	41.8	41.9	42.0	42.1	42.3	42.4	42.6	42.8	43.1	43.4	43.7	44.0	44.3	44.7	44.9	45.2	45.4	45.6	45.8	46.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	46.2	48.0	50.4	53.8	58.7	63.6	67.4	69.7	70.7	71.8	72.3	72.3	72.6	73.0	71.0	42.9	28.0	25.9	26.8	29.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	32.2	35.2	38.1	40.7	41.5	39.1	31.1	19.2	8.6	3.0	1.0	0.3	0.1	0.1	0.1	0.3	0.7	0.8	0.5	0.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.2	0.2	0.3	0.4	0.5	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B440

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.3	12.4	22.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	30.9	38.1	43.4	46.3	47.2	45.2	40.1	30.1	18.7	9.9	5.1	2.1	0.7	0.3	0.2	0.4	0.6	0.2	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	1.9	2.5	2.7	2.7	2.6	2.4	2.4	2.3	2.3	2.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	2.3	2.3	2.4	2.5	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.2	4.5	4.8	5.2	5.6	6.0	6.4	6.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	7.2	7.6	8.1	8.5	8.8	9.2	9.5	9.7	9.9	10.0	10.1	10.0	9.7	9.2	8.5	7.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.549	1.539	1.534	1.531	1.529	1.528	1.527
P	0.911	0.914	0.915	0.916	0.916	0.916	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

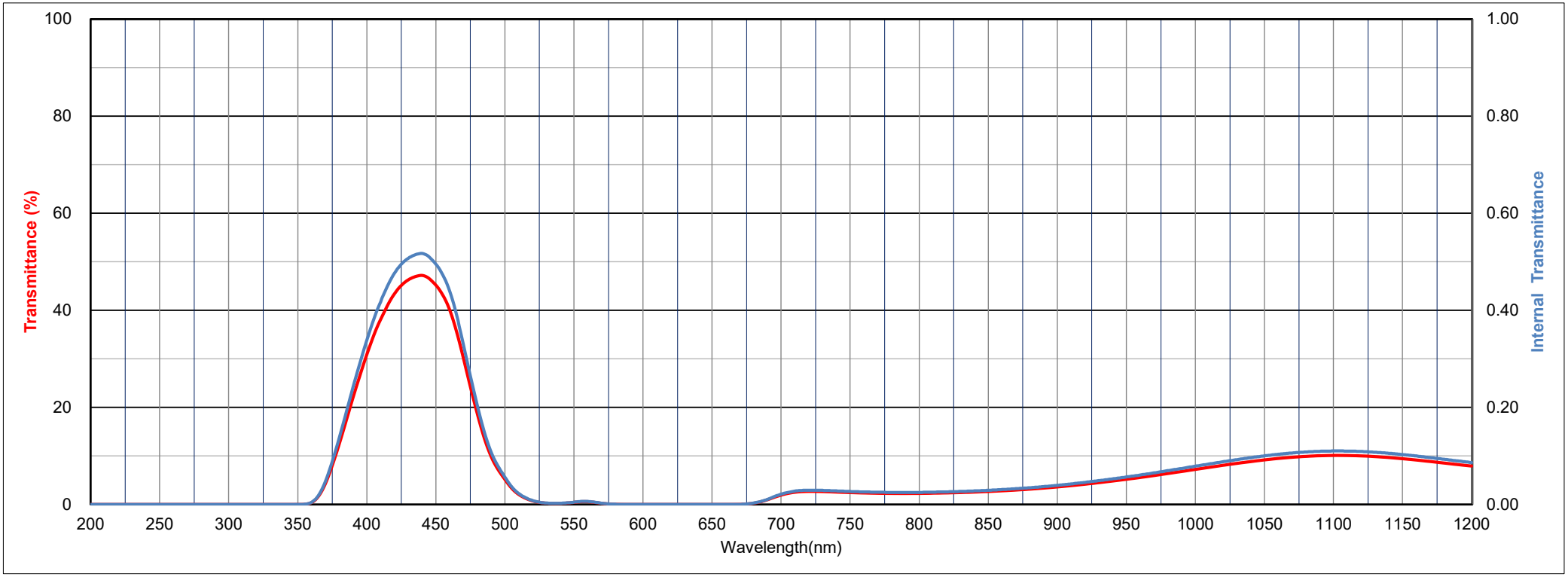
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	0.151	0.038	2	459	97
D65	0.150	0.039	2	460	97

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	480	535	90	105	530	110	2.70

Tolerance of Transmittance (T)

Maximum Transmittance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
47±3	>350	<520



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HOYA

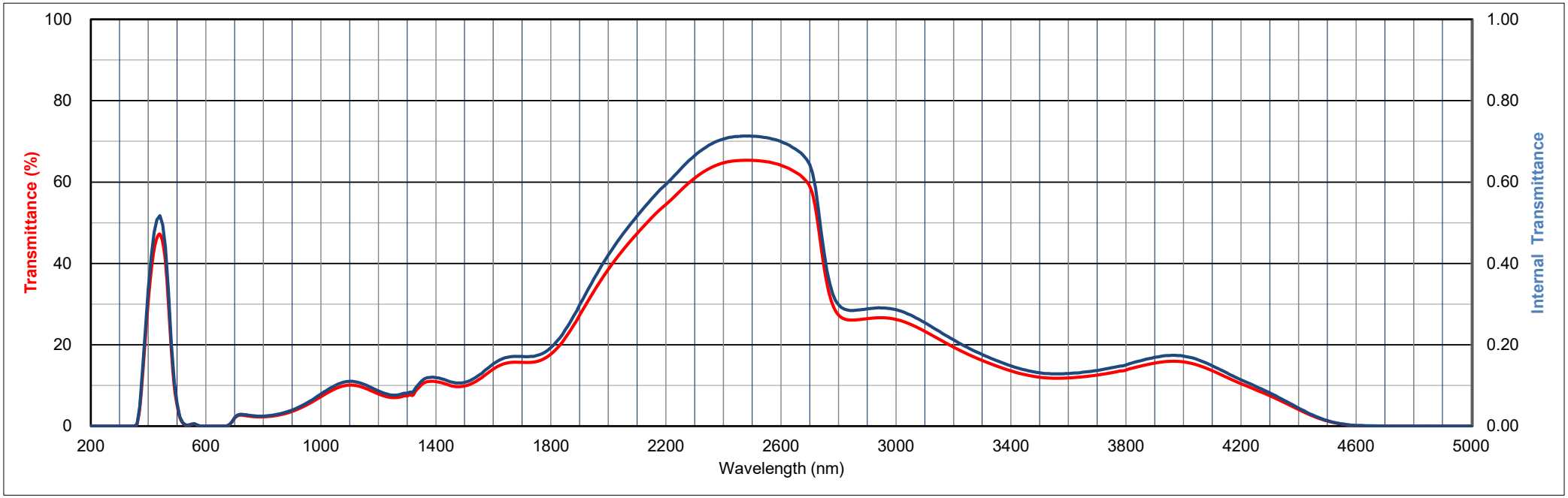
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B440

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.3	12.4	22.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	30.9	38.1	43.4	46.3	47.2	45.2	40.1	30.1	18.7	9.9	5.1	2.1	0.7	0.3	0.2	0.4	0.6	0.2	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.0	1.9	2.5	2.7	2.7	2.6	2.4	2.4	2.3	2.3	2.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	2.3	2.3	2.4	2.5	2.5	2.7	2.8	3.0	3.2	3.4	3.6	3.9	4.2	4.5	4.8	5.2	5.6	6.0	6.4	6.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	7.2	7.6	8.1	8.5	8.8	9.2	9.5	9.7	9.9	10.0	10.1	10.1	10.0	9.9	9.7	9.4	9.2	8.9	8.5	8.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	7.9	7.6	7.4	7.2	7.1	7.0	7.0	7.1	7.2	7.4	7.4	7.7	7.6	8.7	9.4	10.2	10.7	10.9	11.0	11.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	10.9	10.8	10.7	10.4	10.2	10.0	9.8	9.7	9.7	9.8	9.9	10.0	10.3	10.6	11.0	11.5	11.9	12.5	13.0	13.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	14.0	14.5	14.9	15.2	15.4	15.6	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.7	15.9	16.1	16.4	16.7	17.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	17.7	18.3	19.0	19.8	20.7	21.7	22.7	23.8	24.9	26.0	27.3	28.5	29.7	30.9	32.0	33.2	34.3	35.4	36.5	37.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	38.6	43.2	47.4	51.2	54.5	57.8	61.0	63.3	64.7	65.3	65.3	65.0	64.1	62.4	59.0	39.1	27.3	26.1	26.4	26.6
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	26.2	25.1	23.3	21.4	19.4	17.7	16.1	14.8	13.6	12.6	12.0	11.8	11.9	12.1	12.6	13.1	13.8	14.7	15.5	15.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	15.8	15.0	13.6	12.0	10.4	9.0	7.5	5.8	4.1	2.5	1.3	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

B460

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.4	17.0	34.2	49.6	60.6	67.9	73.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	76.6	79.1	81.1	82.4	83.5	84.2	84.6	84.3	83.6	81.9	79.3	75.3	70.1	63.7	56.7	49.2	41.8	34.7	28.3	22.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	18.0	14.1	11.0	8.6	6.7	5.2	4.1	3.4	2.7	2.3	1.9	1.7	1.5	1.3	1.2	1.1	1.1	1.1	1.0	1.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.8	2.0	2.2	2.4	2.6	2.8	3.1	3.4	3.8	4.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	4.5	4.9	5.3	5.8	6.2	6.7	7.3	7.8	8.4	9.0	9.6	11.0	12.4	13.8	15.4	17.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.543	1.533	1.527	1.523	1.521	1.520	1.519
P	0.913	0.915	0.917	0.918	0.918	0.918	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

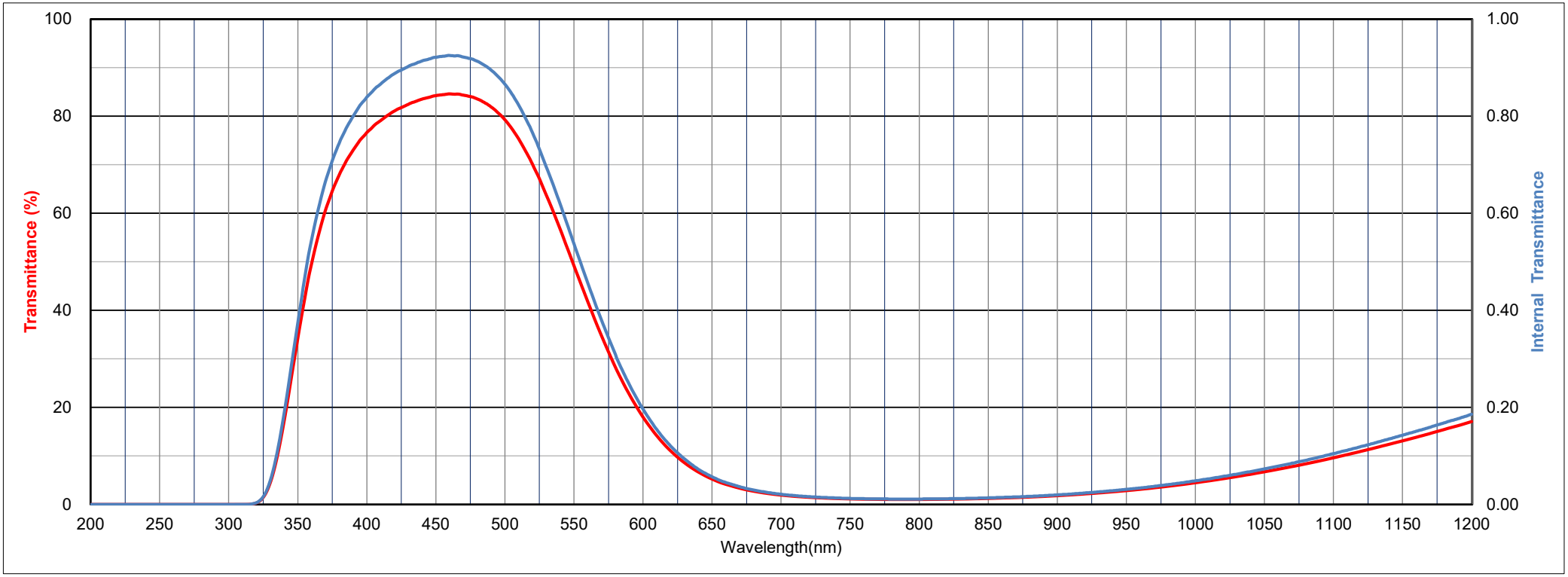
	x	y	Y	λ_d	P_e
A	0.282	0.399	37	494	39
C	0.199	0.251	45	484	47
D65	0.200	0.267	45	485	46

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	505	555	94	109	540	110	2.60

Tolerance of Transmittance (T)

Maximum Transmittance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
85±3	>320	<700



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HOYA

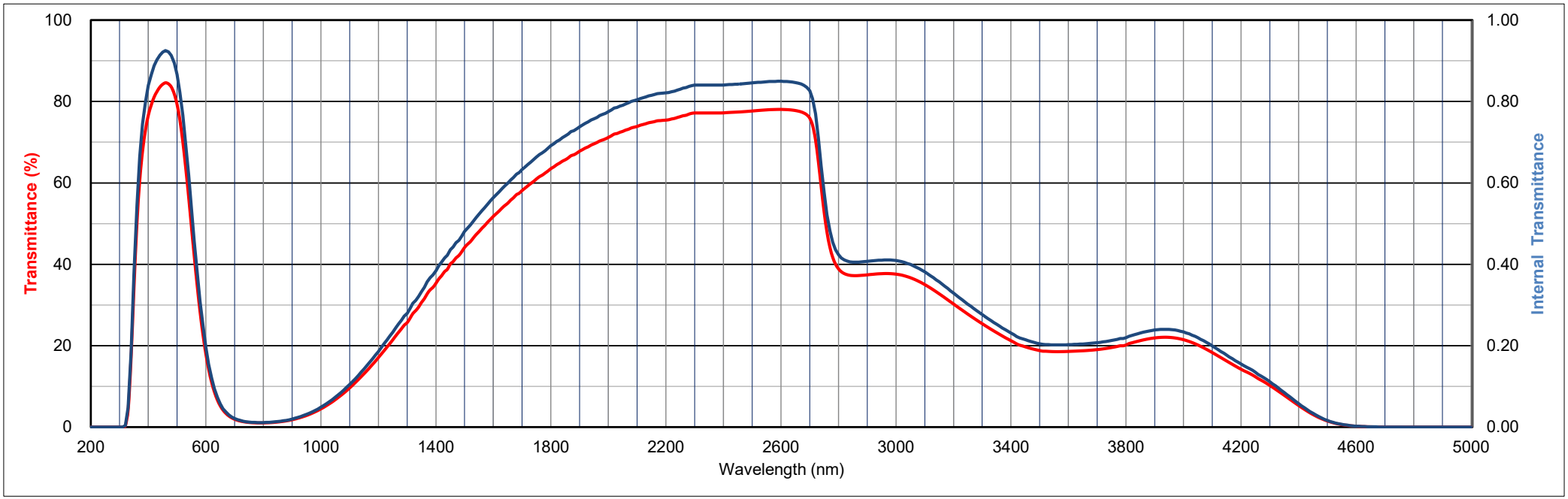
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness 2.50 mm

B460

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.4	17.0	34.2	49.6	60.6	67.9	73.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	76.6	79.1	81.1	82.4	83.5	84.2	84.6	84.3	83.6	81.9	79.3	75.3	70.1	63.7	56.7	49.2	41.8	34.7	28.3	22.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	18.0	14.1	11.0	8.6	6.7	5.2	4.1	3.4	2.7	2.3	1.9	1.7	1.5	1.3	1.2	1.1	1.1	1.1	1.0	1.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.8	2.0	2.2	2.4	2.6	2.8	3.1	3.4	3.8	4.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	4.5	4.9	5.3	5.8	6.2	6.7	7.3	7.8	8.4	9.0	9.6	10.3	11.0	11.7	12.4	13.1	13.8	14.6	15.4	16.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	17.1	17.9	18.8	19.7	20.5	21.4	22.4	23.3	24.1	25.0	25.7	26.7	27.9	28.6	29.5	30.6	31.6	32.8	33.7	34.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	35.3	36.4	37.2	38.2	38.8	40.0	40.7	41.6	42.2	43.1	44.2	44.9	45.6	46.4	47.3	48.0	48.8	49.5	50.3	51.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	51.8	52.4	53.1	53.8	54.5	55.0	55.8	56.4	57.1	57.5	58.1	58.7	59.3	59.9	60.4	61.0	61.5	61.9	62.4	62.9
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	63.5	63.9	64.5	64.9	65.3	65.7	66.1	66.7	66.9	67.3	67.8	68.2	68.6	68.9	69.3	69.6	69.9	70.3	70.6	70.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	71.2	72.7	73.9	74.9	75.4	76.3	77.2	77.2	77.2	77.4	77.7	77.9	78.1	77.8	75.9	53.0	38.9	37.2	37.4	37.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	37.6	36.7	35.0	32.8	30.3	27.8	25.4	23.2	21.2	19.7	18.8	18.5	18.6	18.8	19.0	19.6	20.2	21.3	21.9	22.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.5	20.2	18.3	16.2	14.2	12.4	10.2	7.8	5.3	3.1	1.5	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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Green Filters

Green filters transmit relatively narrow bands within the green wavelength region.
The 3-digit value after the capital letter indicates the wavelength of maximum transmittance. For example, G530 indicates that the transmittance is maximum when the wavelength is approximately 530 nm.
Green filters are used as band-pass filters, RGB separation filters and more.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G530

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.4	3.6	7.5	12.6	17.1	18.9	17.1	12.7	7.9	4.2	1.9	0.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.7	1.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.597	1.581	1.573	1.568	1.565	1.564	1.562
P	0.900	0.904	0.906	0.907	0.907	0.908	0.908

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

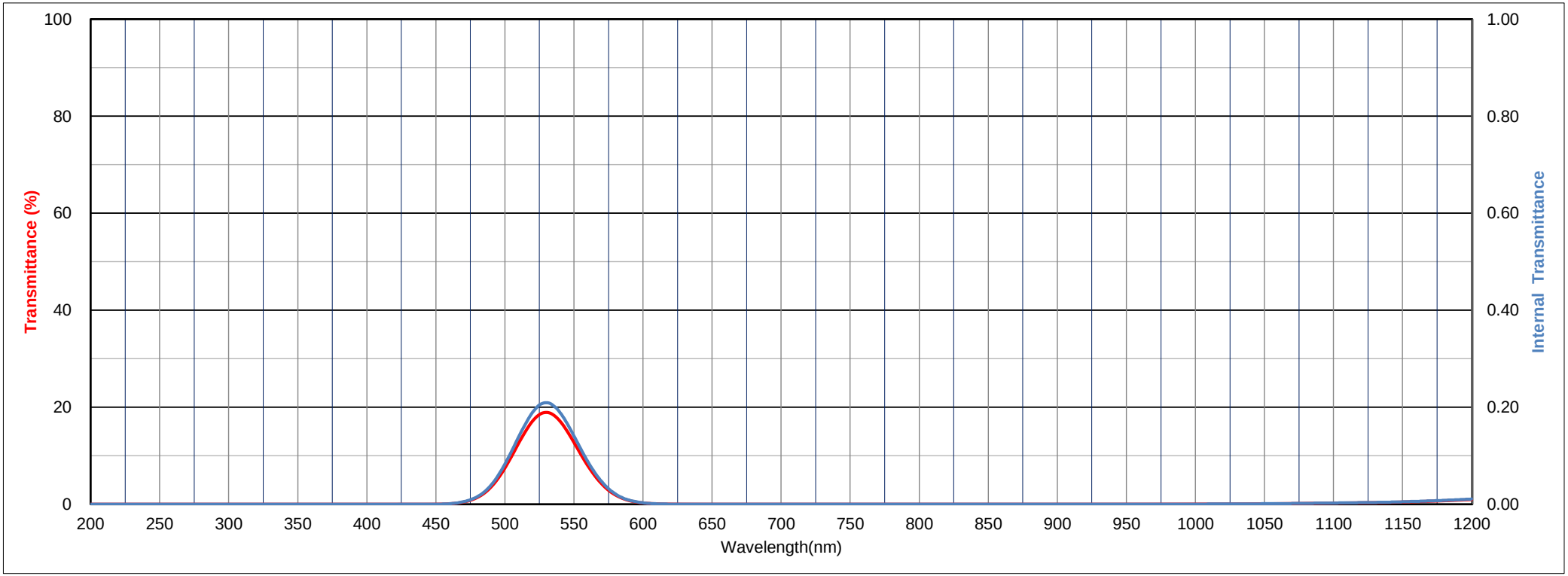
	x	y	Y	λ_d	P_e
A	0.247	0.690	6	532	73
C	0.221	0.686	8	536	80
D65	0.216	0.693	8	535	80

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	450	495	94	100	500	130	3.12

Tolerance of Transmittance (T)

Maximum Transmitance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
18±3	>470	<580



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HOYA

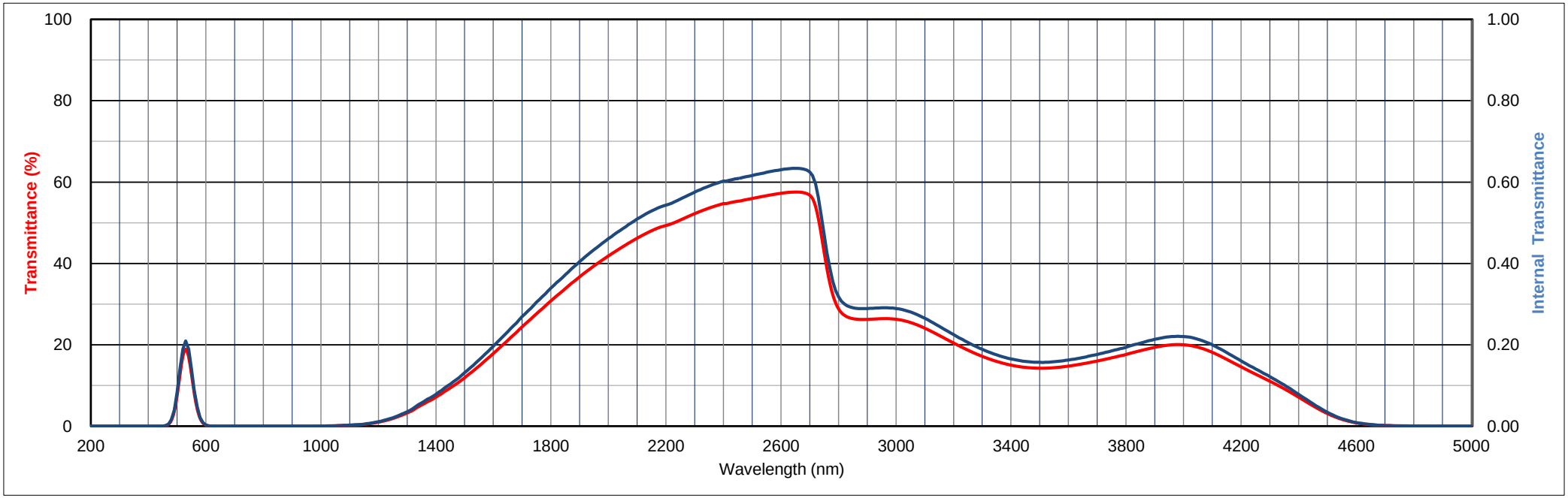
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G530

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.4	3.6	7.5	12.6	17.1	18.9	17.1	12.7	7.9	4.2	1.9	0.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.4	2.6	2.9	3.2	3.5	3.9	4.4	4.8	5.2	5.6	6.0	6.3	6.7
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	7.1	7.6	8.0	8.5	8.9	9.4	9.9	10.3	10.8	11.4	11.9	12.5	13.1	13.6	14.2	14.8	15.4	16.0	16.6	17.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	17.9	18.5	19.2	19.8	20.4	21.1	21.8	22.4	23.0	23.8	24.4	25.1	25.7	26.3	27.0	27.6	28.3	28.9	29.5	30.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	30.8	31.4	32.0	32.6	33.2	33.8	34.4	35.0	35.6	36.1	36.7	37.3	37.8	38.4	38.9	39.4	39.9	40.4	40.9	41.4
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	41.8	44.1	46.2	48.0	49.3	50.7	52.2	53.6	54.7	55.3	56.0	56.7	57.2	57.5	56.8	42.8	28.9	26.4	26.2	26.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	26.3	25.5	24.1	22.3	20.4	18.7	17.2	15.9	15.0	14.4	14.2	14.4	14.8	15.3	16.0	16.8	17.6	18.6	19.4	19.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	20.0	19.4	18.1	16.4	14.6	12.8	11.1	9.2	7.1	5.0	3.1	1.7	0.8	0.4	0.2	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G533

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.1	0.5	1.7	4.7	9.8	16.8	25.7	35.3	44.1	50.6	53.8	53.3	49.4	43.3	35.9	28.3	21.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	15.7	11.4	8.3	6.2	5.0	4.2	3.5	3.3	3.2	2.8	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.7	3.8	3.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	4.0	4.1	4.2	4.4	4.5	4.7	4.9	5.2	5.4	5.7	6.1	6.4	6.9	7.3	7.8	8.2	8.8	9.3	9.9	10.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	11.2	11.8	12.5	13.3	14.0	14.8	15.6	16.4	17.2	18.0	18.9	20.7	22.5	24.3	26.1	28.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.551	1.541	1.536	1.533	1.531	1.529	1.529
P	0.911	0.913	0.915	0.915	0.916	0.916	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

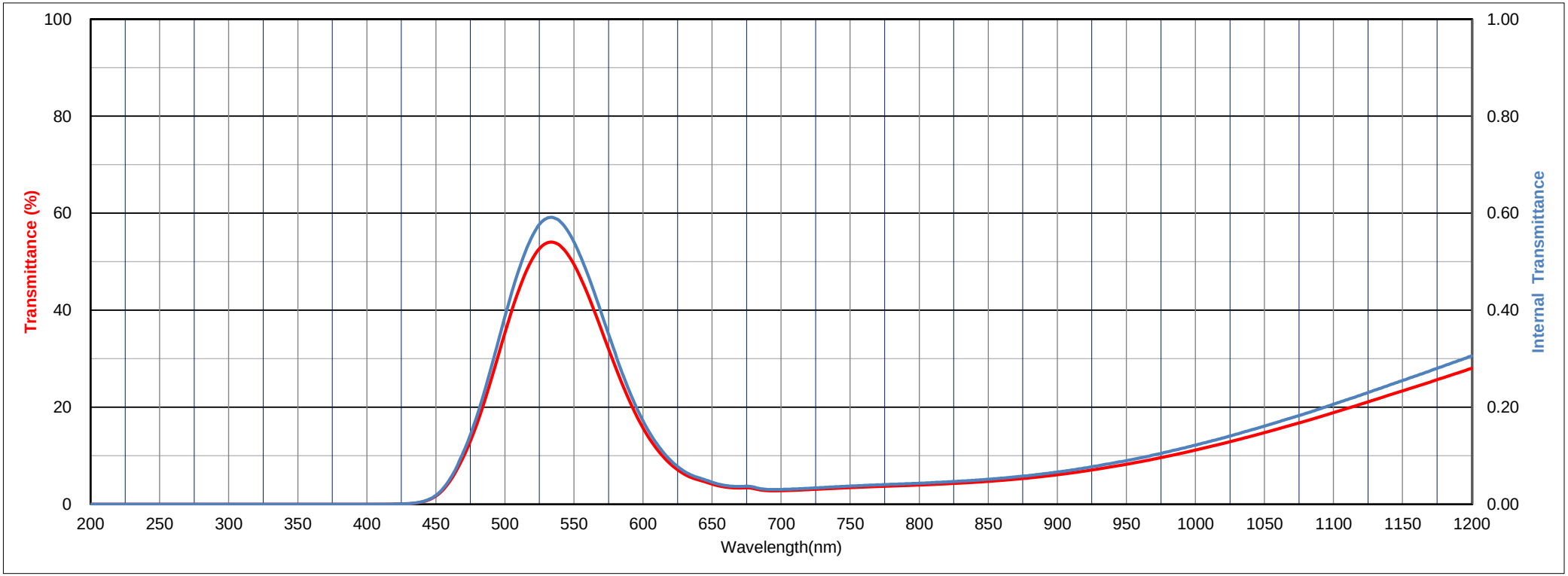
	x	y	Y	λ_d	P_e
A	0.367	0.566	31	551	56
C	0.303	0.564	35	550	65
D65	0.299	0.572	35	549	65

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	550	600	87	103	580	140	2.60

Tolerance of Transmittance (T)

Maximum Transmitance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
18±3	>470	<580



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HOYA

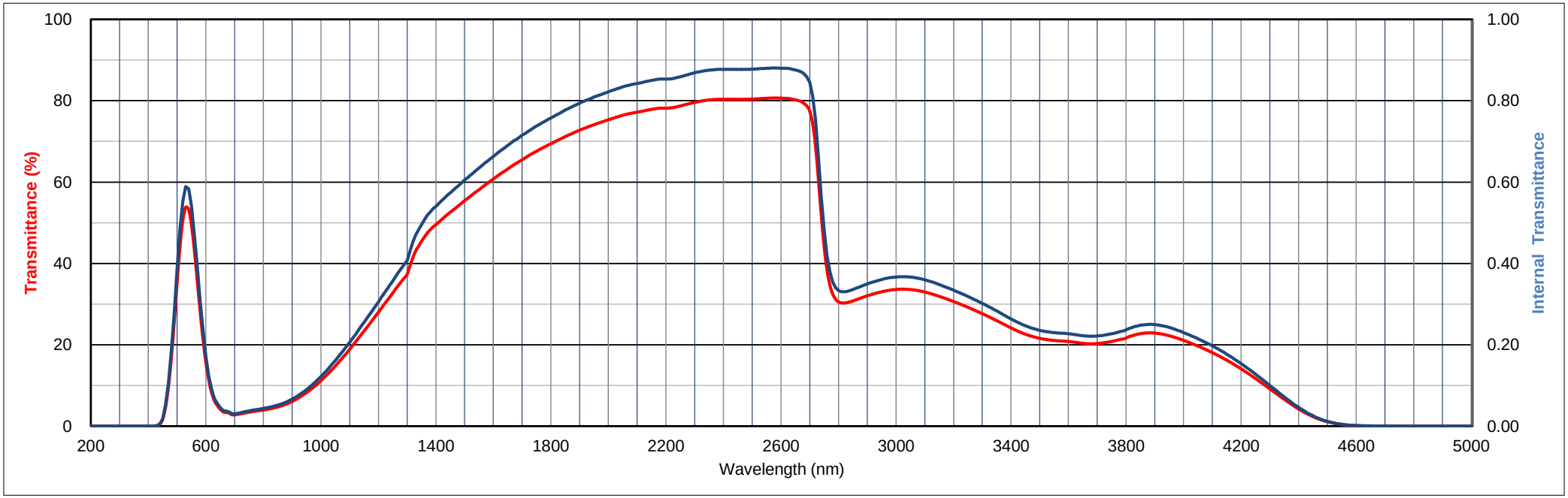
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G533

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.1	0.5	1.7	4.7	9.8	16.8	25.7	35.3	44.1	50.6	53.8	53.3	49.4	43.3	35.9	28.3	21.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	15.7	11.4	8.3	6.2	5.0	4.2	3.5	3.3	3.2	2.8	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.7	3.8	3.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	4.0	4.1	4.2	4.4	4.5	4.7	4.9	5.2	5.4	5.7	6.1	6.4	6.9	7.3	7.8	8.2	8.8	9.3	9.9	10.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	11.2	11.8	12.5	13.3	14.0	14.8	15.6	16.4	17.2	18.0	18.9	19.8	20.7	21.6	22.5	23.4	24.3	25.2	26.1	27.1
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	28.0	29.0	29.9	30.9	31.8	32.7	33.7	34.7	35.5	36.4	37.3	39.5	41.4	43.1	44.3	45.4	46.5	47.5	48.2	49.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	49.5	50.1	50.8	51.4	52.0	52.6	53.1	53.7	54.3	54.8	55.4	56.0	56.5	57.1	57.6	58.1	58.7	59.2	59.7	60.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	60.8	61.3	61.8	62.3	62.7	63.2	63.7	64.2	64.6	65.1	65.5	65.9	66.4	66.8	67.2	67.6	68.0	68.4	68.7	69.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	69.4	69.8	70.1	70.5	70.8	71.2	71.5	71.8	72.1	72.5	72.8	73.0	73.3	73.6	73.9	74.1	74.4	74.6	74.8	75.1
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	75.3	76.4	77.2	77.9	78.2	78.7	79.6	80.2	80.4	80.4	80.4	80.6	80.6	80.2	77.4	44.3	30.6	30.8	32.0	33.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	33.6	33.6	33.0	31.9	30.6	29.2	27.7	26.0	24.2	22.6	21.6	21.1	20.8	20.4	20.3	20.8	21.7	22.7	22.9	22.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.1	19.7	18.1	16.2	14.1	11.7	9.2	6.6	4.2	2.3	1.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G545

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	2.6	6.5	11.2	14.5	14.6	11.7	7.8	4.4	2.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.5	1.8	2.0	2.2	2.8	3.5	4.3	5.2	6.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.601	1.585	1.576	1.572	1.569	1.567	1.565
P	0.899	0.903	0.905	0.906	0.907	0.907	0.907

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

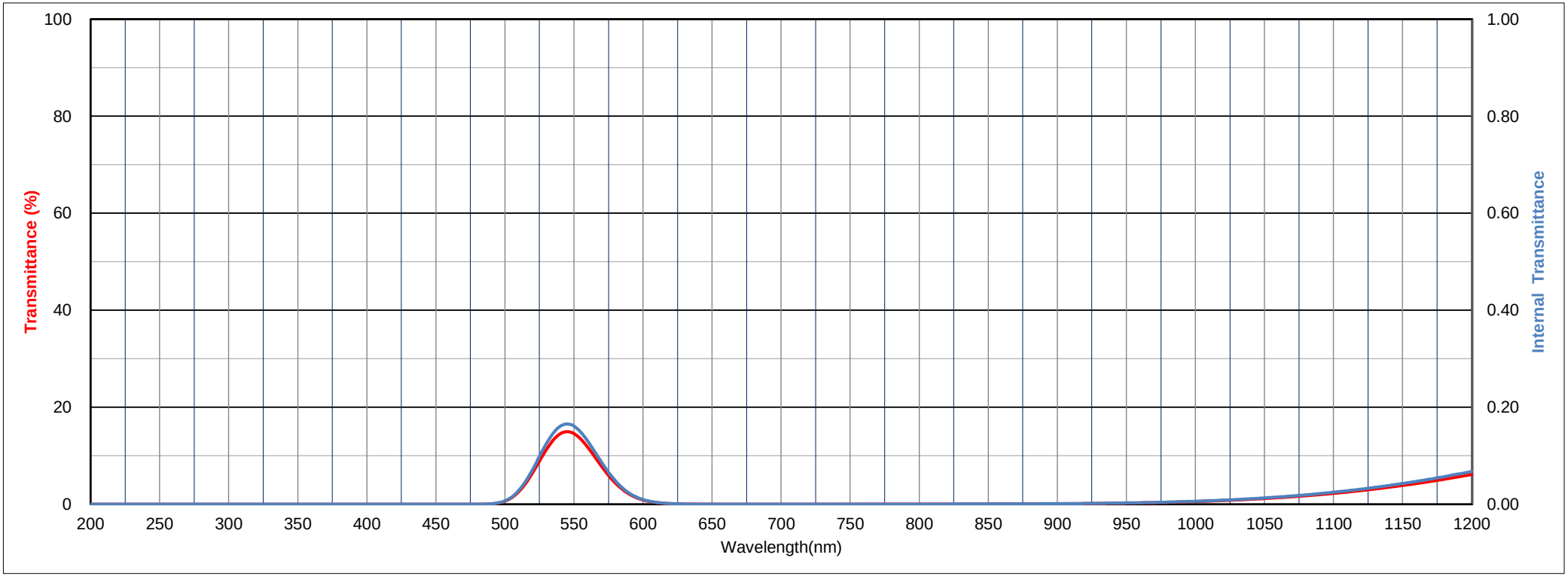
	x	y	Y	λ_d	P_e
A	0.338	0.646	6	554	92
C	0.317	0.663	7	552	96
D65	0.312	0.667	7	551	96

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	1	460	510	92	103	500	130	3.10

Tolerance of Transmittance (T)

Maximum Transmitance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
18±3	>470	<580



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The content of this catalog is accurate as of October ,2020

HOYA

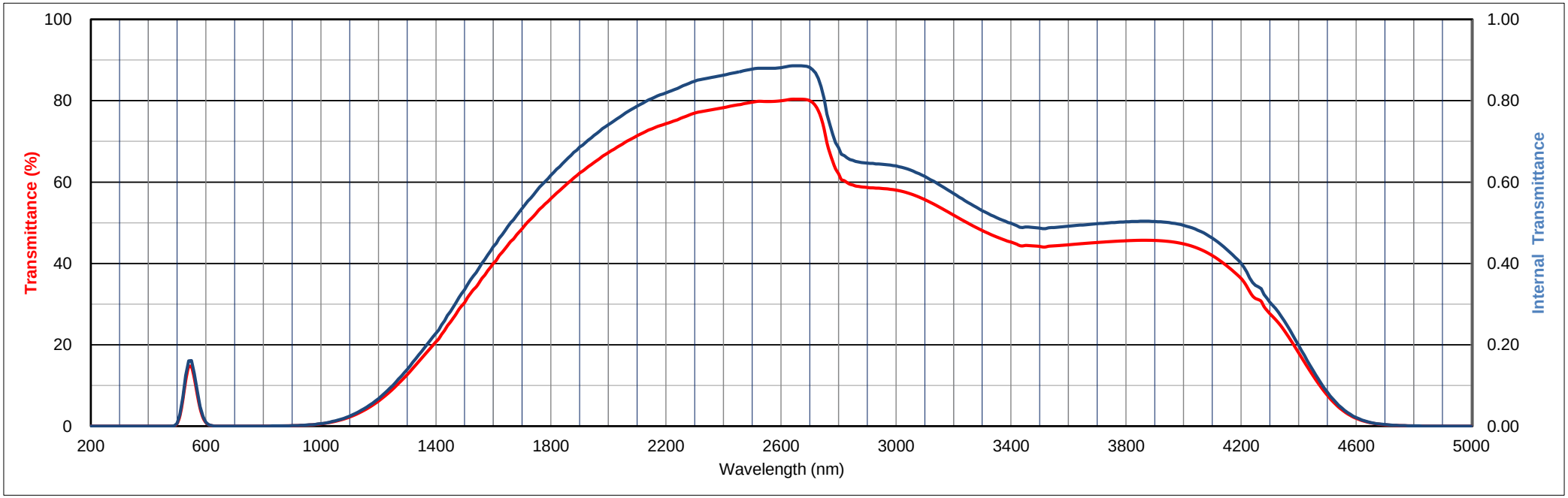
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G545

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	2.6	6.5	11.2	14.5	14.6	11.7	7.8	4.4	2.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.9	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.6	0.7	0.8	0.9	1.0	1.2	1.4	1.5	1.8	2.0	2.2	2.5	2.8	3.2	3.5	3.9	4.3	4.7	5.2	5.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	6.1	6.7	7.3	7.8	8.5	9.1	9.8	10.5	11.2	11.9	12.6	13.4	14.2	15.0	15.9	16.7	17.5	18.3	19.1	19.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	20.7	21.5	22.6	23.5	24.7	25.5	26.5	27.5	28.7	29.6	30.4	31.6	32.6	33.5	34.2	35.2	36.3	37.1	38.2	39.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	40.0	40.8	41.9	42.7	43.6	44.5	45.4	46.0	47.0	47.8	48.5	49.4	50.2	50.9	51.6	52.4	53.3	53.9	54.6	55.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	56.0	56.6	57.3	57.9	58.5	59.2	59.8	60.4	61.0	61.6	62.2	62.7	63.2	63.8	64.3	64.8	65.3	65.8	66.4	66.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	67.3	69.4	71.4	73.1	74.4	75.6	77.0	77.7	78.3	79.0	79.6	79.8	80.0	80.4	80.0	73.1	62.1	59.3	58.7	58.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	58.0	57.1	55.7	53.9	51.9	49.9	48.1	46.5	45.3	44.4	44.2	44.3	44.6	44.9	45.1	45.4	45.6	45.7	45.7	45.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	44.8	43.7	41.9	39.4	36.3	31.4	27.7	23.5	18.1	12.5	7.6	4.1	1.9	0.8	0.3	0.1	0.1	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G550

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.1	0.5	1.6	4.0	8.9	17.0	27.2	37.3	47.6	57.1	65.4	72.0	76.8	79.6	80.7	80.0	77.8	74.5	70.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	65.3	60.4	55.9	52.3	50.5	50.2	49.4	51.0	54.8	53.7	56.2	60.0	64.1	68.1	71.8	75.1	78.0	80.4	82.4	83.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	85.1	86.0	86.5	87.0	87.3	87.7	87.9	88.1	88.2	88.4	88.5	88.7	88.8	89.0	89.0	89.1	89.2	89.3	89.4	89.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.5	89.5	89.6	89.7	89.8	89.8	89.8	89.9	89.9	90.0	90.1	90.2	90.2	90.3	90.4	90.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.538	1.530	1.525	1.523	1.521	1.520	1.519
P	0.914	0.916	0.917	0.918	0.918	0.918	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

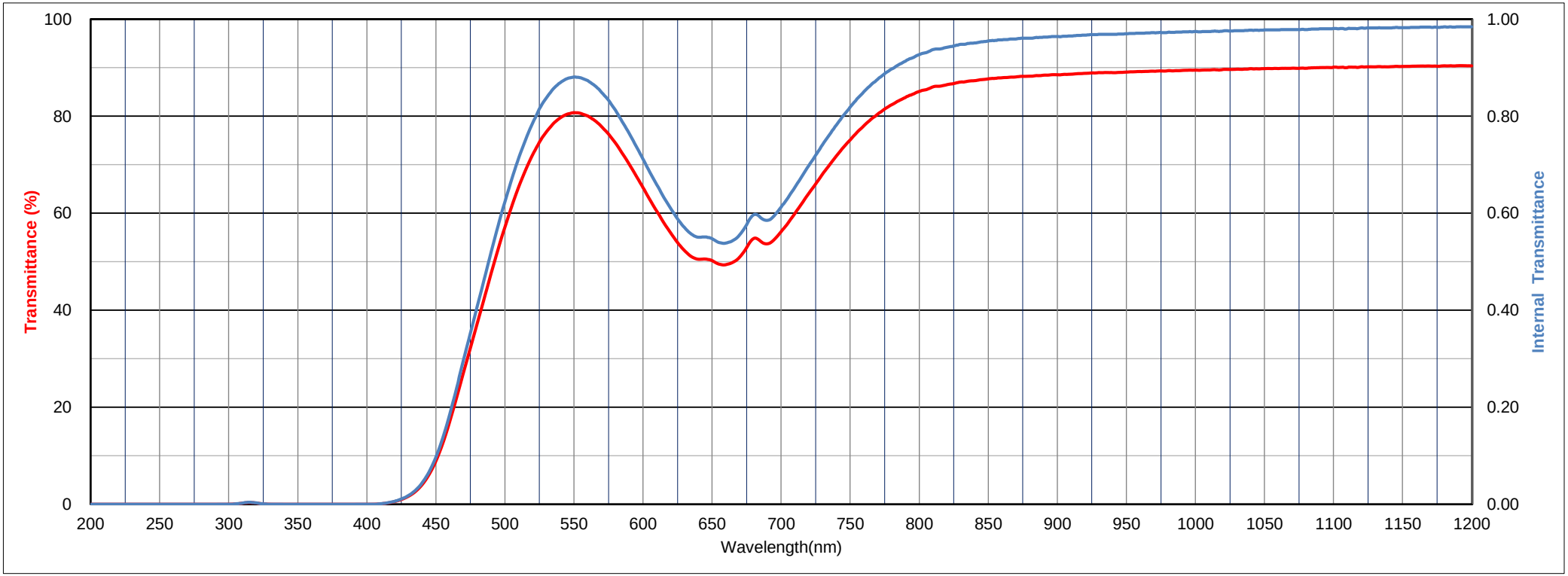
	x	y	Y	λ_d	P_e
A	0.467	0.478	70	575	63
C	0.379	0.481	69	567	63
D65	0.377	0.489	70	566	63

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	1	545	590	90	104	560	130	2.58

Tolerance of Transmittance (T)

Maximum Transmitance	Less than 1% Wavelength at Short wave Side	Less than 5% Wavelength at Long wave Side
Tmax(%)	λs1(nm)	λl5(nm)
18±3	>470	<580



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HOYA

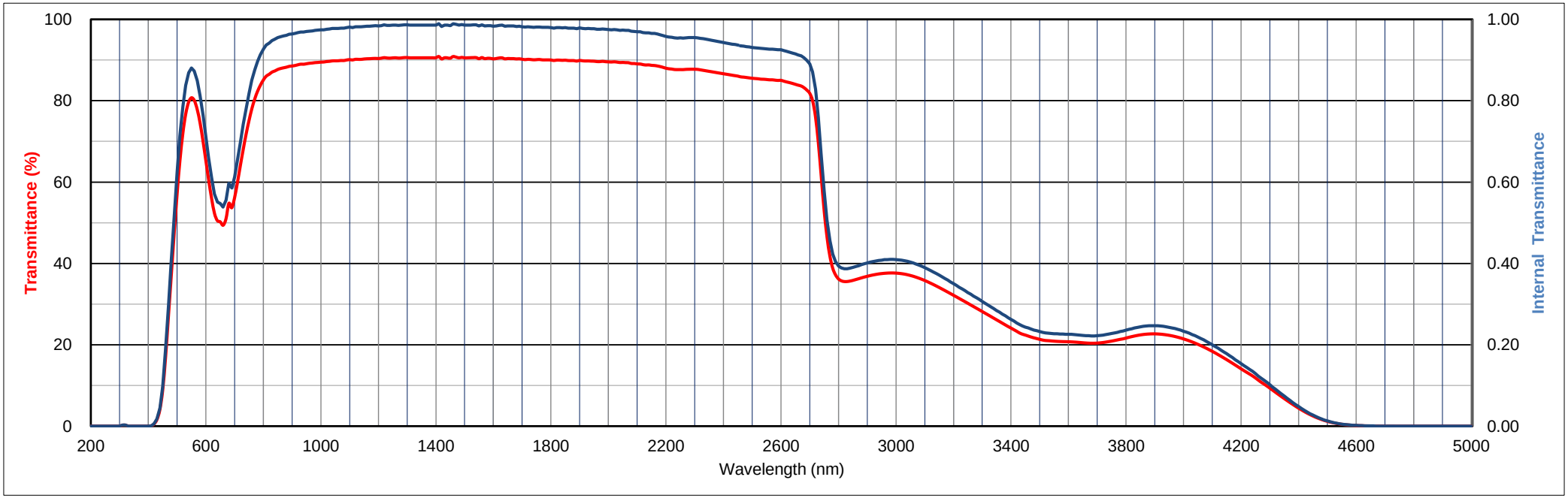
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

G550

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.1	0.5	1.6	4.0	8.9	17.0	27.2	37.3	47.6	57.1	65.4	72.0	76.8	79.6	80.7	80.0	77.8	74.5	70.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	65.3	60.4	55.9	52.3	50.5	50.2	49.4	51.0	54.8	53.7	56.2	60.0	64.1	68.1	71.8	75.1	78.0	80.4	82.4	83.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	85.1	86.0	86.5	87.0	87.3	87.7	87.9	88.1	88.2	88.4	88.5	88.7	88.8	89.0	89.0	89.1	89.2	89.3	89.4	89.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.5	89.5	89.6	89.7	89.8	89.8	89.8	89.9	89.9	90.0	90.1	90.0	90.2	90.2	90.2	90.3	90.3	90.3	90.4	90.4
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.4	90.5	90.6	90.5	90.5	90.5	90.6	90.5	90.5	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6	90.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.6	90.9	90.3	90.6	90.5	90.5	90.9	90.7	90.5	90.7	90.5	90.6	90.6	90.6	90.6	90.3	90.6	90.3	90.4	90.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.3	90.4	90.5	90.5	90.3	90.4	90.3	90.4	90.3	90.3	90.2	90.1	90.2	90.1	90.1	90.1	90.1	90.0	90.0	90.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	90.0	89.9	90.0	90.0	89.9	90.0	89.9	89.9	89.9	89.7	89.9	89.8	89.8	89.8	89.7	89.7	89.6	89.6	89.7	89.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.6	89.4	89.0	88.7	88.0	87.7	87.7	87.2	86.6	86.1	85.5	85.2	85.0	84.0	81.8	53.1	36.2	35.8	36.8	37.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	37.6	37.0	35.8	34.1	32.2	30.2	28.2	26.1	24.1	22.4	21.3	20.9	20.7	20.5	20.4	20.9	21.7	22.4	22.7	22.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.4	20.1	18.4	16.3	14.1	11.9	9.4	6.8	4.4	2.5	1.2	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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Light Balancing Filters

There is a correlation between the temperature and color of a light-emitting substance and it can be replaced with a numeric value. This temperature is called "Color Temperature".
For example, the standard color temperature of a PC monitor is approximately 6500 K and is visually a little yellow "Color". The surface temperature of the sun is approximately 6000 K and is almost the same temperature.
The unit is the reciprocal of "Color Temperature" multiplied by 106 that is called mired (micro reciprocal degree) and is used to indicate the conversion ability of color temperatures.
When the color temperature of the original light source is K1 and the color temperature of the filtered light is K2, the color temperature conversion ability of this filter is calculated as follows:

$$\left(\frac{10^6}{K_2} - \frac{10^6}{K_1}\right) \text{ Mired}$$

This value becomes + with a filter of amber type (red), which deceases the color temperature, and becomes - with a filter of blue type (blue), which increases the color temperature.

Color temperature conversion ability

The definition of "Color Temperature Conversion Ability" is shown as follows:
B-R conversion ability (V)
$V=22.1(\log T_r - \log T_b)$ Decamired

Tr: Average value (%) of transmittances of the filter at 610 nm, 635 nm, and 655 nm wavelengths

$$T_r = \frac{(T_{610}+T_{635}+T_{655})}{3}$$

Tb: Average value (%) of transmittances of the filter at 405 nm, 435 nm, and 465 nm of wavelengths

$$T_b = \frac{(T_{405}+T_{435}+T_{465})}{3}$$

G-R conversion ability (w)
$W=61.6(\log T_r - \log T_g)$ Decamired

Tg: Average value (%) of transmittances of the filter at 510 nm, 545 nm, and 565 nm wavelengths

$$T_g = \frac{(T_{510}+T_{545}+T_{565})}{3}$$

Thickness and color temperature conversion ability
The relationship between the color temperature conversion ability and thickness is shown as follows:

$$\frac{v1}{v2} = \frac{t1}{t2}$$

v1: Conversion ability at thickness of t1
v2: Conversion ability at thickness of t2
Change in the thickness with use of this relationship allows the given color temperature conversion ability to be acquired.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LA20

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.3	16.2	32.0	46.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	56.3	61.9	62.6	63.4	63.3	63.0	62.9	63.0	63.3	63.9	64.4	65.2	66.0	66.7	67.9	69.3	70.6	71.9	72.7	73.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.3	75.0	75.6	75.9	76.4	77.2	78.4	79.9	81.6	83.3	84.4	85.1	85.7	86.3	86.8	87.2	87.5	87.8	88.0	88.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.5	88.3	88.2	88.3	88.5	88.7	88.8	88.9	89.1	89.2	89.3	89.5	89.6	89.7	89.8	90.0	90.0	90.1	90.2	90.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	90.2	90.3	90.3	90.3	90.3	90.4	90.3	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.5	90.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.569	1.555	1.547	1.543	1.540	1.538	1.537
P	0.907	0.910	0.912	0.913	0.913	0.914	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

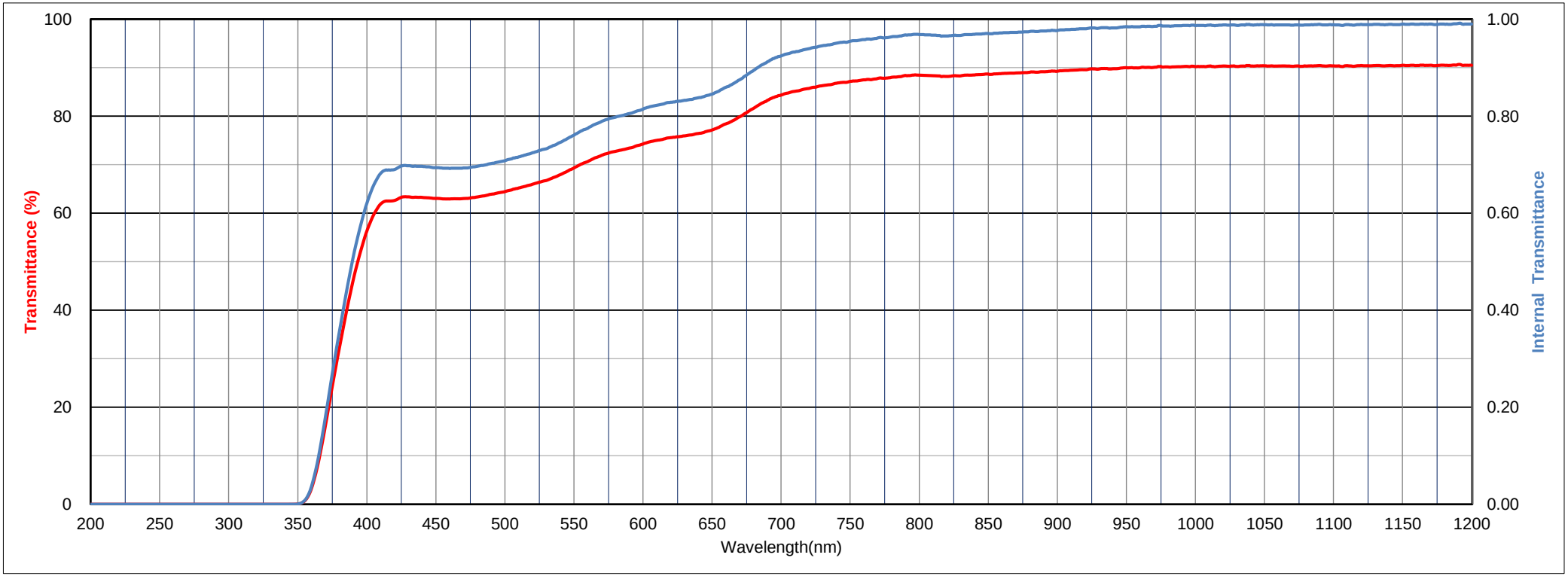
	x	y	Y	λ_d	P_e
A	0.463	0.408	71	591	11
C	0.326	0.326	70	584	7
D65	0.329	0.339	70	584	7

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	505	545	89	102	520	130	2.73

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
20±5



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HOYA

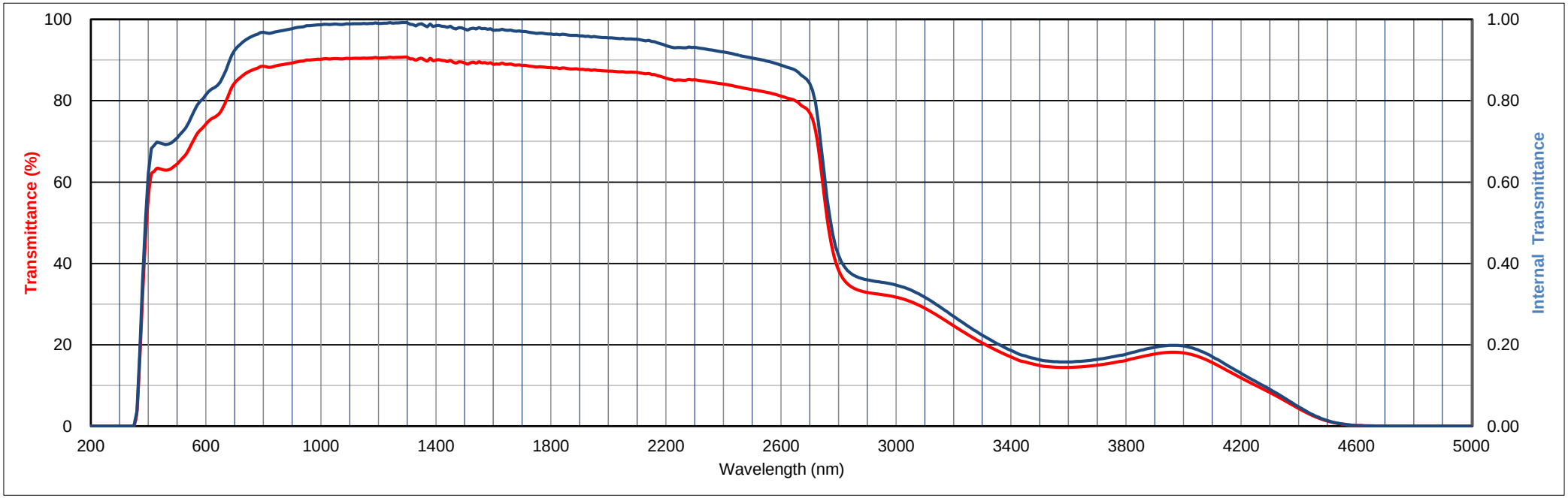
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LA20

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.3	16.2	32.0	46.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	56.3	61.9	62.6	63.4	63.3	63.0	62.9	63.0	63.3	63.9	64.4	65.2	66.0	66.7	67.9	69.3	70.6	71.9	72.7	73.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.3	75.0	75.6	75.9	76.4	77.2	78.4	79.9	81.6	83.3	84.4	85.1	85.7	86.3	86.8	87.2	87.5	87.8	88.0	88.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.5	88.3	88.2	88.3	88.5	88.7	88.8	88.9	89.1	89.2	89.3	89.5	89.6	89.7	89.8	90.0	90.0	90.1	90.2	90.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	90.2	90.3	90.3	90.3	90.3	90.4	90.3	90.3	90.3	90.4	90.4	90.4	90.4	90.4	90.4	90.5	90.4	90.5	90.5	90.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.5	90.5	90.6	90.6	90.7	90.6	90.6	90.7	90.7	90.7	90.7	90.3	90.3	90.0	90.3	90.4	90.1	89.8	90.4	89.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.0	90.1	89.9	89.9	89.6	89.9	89.5	89.3	89.6	89.5	89.3	89.0	89.3	89.5	89.2	89.6	89.3	89.4	89.2	89.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.0	89.0	89.0	89.2	89.0	89.0	89.0	88.8	88.8	88.8	88.7	88.7	88.6	88.5	88.4	88.3	88.4	88.3	88.2	88.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	88.1	88.0	88.1	87.9	88.1	88.0	87.9	87.8	87.8	87.8	87.7	87.7	87.6	87.7	87.5	87.6	87.5	87.4	87.4	87.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	87.3	87.1	87.0	86.5	85.5	85.1	85.2	84.6	84.1	83.4	82.7	82.1	81.1	80.0	77.0	56.9	38.4	34.0	32.9	32.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	31.7	30.6	29.0	26.9	24.7	22.5	20.5	18.6	17.0	15.8	14.9	14.5	14.4	14.6	15.0	15.5	16.2	17.0	17.7	18.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	18.0	17.1	15.6	13.8	11.9	10.1	8.3	6.4	4.4	2.6	1.3	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LA40

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.2	11.5	23.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	35.0	44.1	48.8	53.2	56.1	58.6	60.6	62.2	63.7	65.1	66.4	67.6	68.7	69.9	71.1	72.4	73.7	74.9	75.8	76.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	77.2	77.9	78.3	78.6	79.1	79.7	80.7	81.9	83.3	84.5	85.3	86.0	86.4	86.8	87.1	87.4	87.6	87.8	87.9	88.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.3	88.5	88.6	88.6	88.8	88.9	88.9	89.1	89.1	89.2	89.4	89.5	89.6	89.7	89.7	89.9	89.9	90.0	90.1	90.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	90.1	90.2	90.3	90.2	90.2	90.3	90.3	90.2	90.3	90.3	90.3	90.4	90.4	90.5	90.5	90.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.576	1.561	1.554	1.549	1.546	1.544	1.543
P	0.905	0.908	0.910	0.911	0.912	0.912	0.913

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

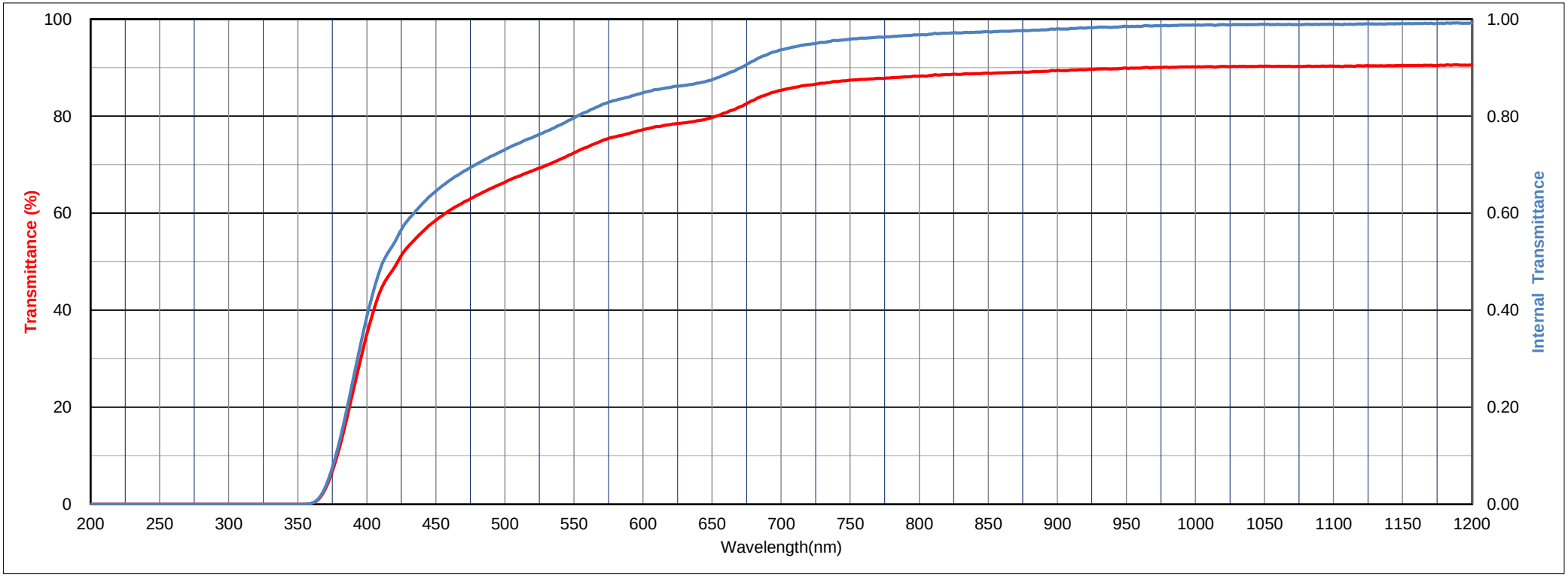
	x	y	Y	λ_d	P_e
A	0.467	0.414	74	586	18
C	0.334	0.341	73	577	13
D65	0.336	0.353	73	576	13

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	505	550	88	102	520	130	2.76

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
40±5



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The content of this catalog is accurate as of October ,2020

HOYA

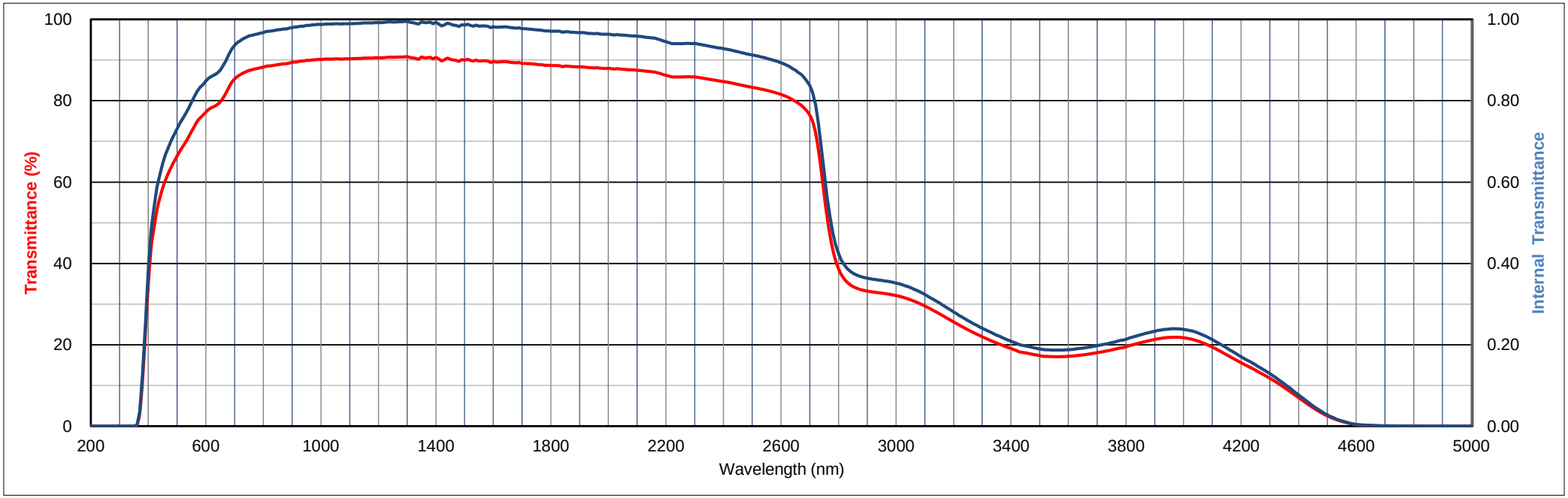
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LA40

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.2	11.5	23.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	35.0	44.1	48.8	53.2	56.1	58.6	60.6	62.2	63.7	65.1	66.4	67.6	68.7	69.9	71.1	72.4	73.7	74.9	75.8	76.4
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	77.2	77.9	78.3	78.6	79.1	79.7	80.7	81.9	83.3	84.5	85.3	86.0	86.4	86.8	87.1	87.4	87.6	87.8	87.9	88.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	88.3	88.5	88.6	88.6	88.8	88.9	88.9	89.1	89.1	89.2	89.4	89.5	89.6	89.7	89.7	89.9	89.9	90.0	90.1	90.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	90.1	90.2	90.3	90.2	90.2	90.3	90.3	90.2	90.3	90.3	90.3	90.3	90.4	90.4	90.4	90.5	90.5	90.5	90.5	90.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.5	90.5	90.6	90.7	90.7	90.7	90.7	90.7	90.7	90.8	90.8	90.6	90.5	90.4	90.2	90.7	90.5	90.6	90.7	90.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.6	90.3	89.8	90.1	90.4	90.2	90.0	89.9	89.7	90.1	90.0	90.2	89.9	89.8	90.0	89.7	89.8	89.8	89.8	89.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.6	89.5	89.5	89.6	89.6	89.6	89.4	89.4	89.3	89.4	89.2	89.2	89.1	89.1	89.0	88.9	88.9	88.8	88.7	88.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	88.7	88.7	88.6	88.6	88.4	88.5	88.5	88.4	88.4	88.3	88.3	88.3	88.2	88.2	88.1	88.1	88.1	88.0	88.0	87.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.0	87.7	87.5	87.1	86.3	85.8	85.9	85.3	84.7	84.0	83.3	82.5	81.5	79.8	76.5	57.0	38.7	34.3	33.2	32.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	32.1	31.1	29.5	27.7	25.6	23.7	22.0	20.4	19.1	18.0	17.3	17.1	17.2	17.5	18.1	18.7	19.5	20.5	21.3	21.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.7	20.9	19.4	17.5	15.6	13.8	11.8	9.5	7.0	4.6	2.5	1.2	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

E-LA80

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.9	4.7	5.8	5.9	5.8	6.3	7.8	11.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	16.2	23.1	30.6	37.6	42.9	46.2	48.0	48.9	49.5	50.3	51.6	53.5	56.2	59.5	63.1	66.7	70.2	73.3	76.1	78.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	80.4	81.9	83.0	83.9	84.3	84.4	84.2	83.9	83.2	82.3	81.5	80.5	79.6	78.8	78.1	77.7	77.5	77.4	77.6	78.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	78.6	79.3	80.0	80.9	81.9	82.9	83.9	84.8	85.6	86.4	87.0	87.7	88.1	88.5	88.9	89.1	89.3	89.5	89.6	89.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.8	89.9	89.9	90.0	90.1	90.1	90.1	90.2	90.2	90.3	90.3	90.4	90.5	90.5	90.6	90.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.540	1.531	1.526	1.523	1.521	1.520	1.519
P	0.913	0.916	0.917	0.918	0.918	0.918	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

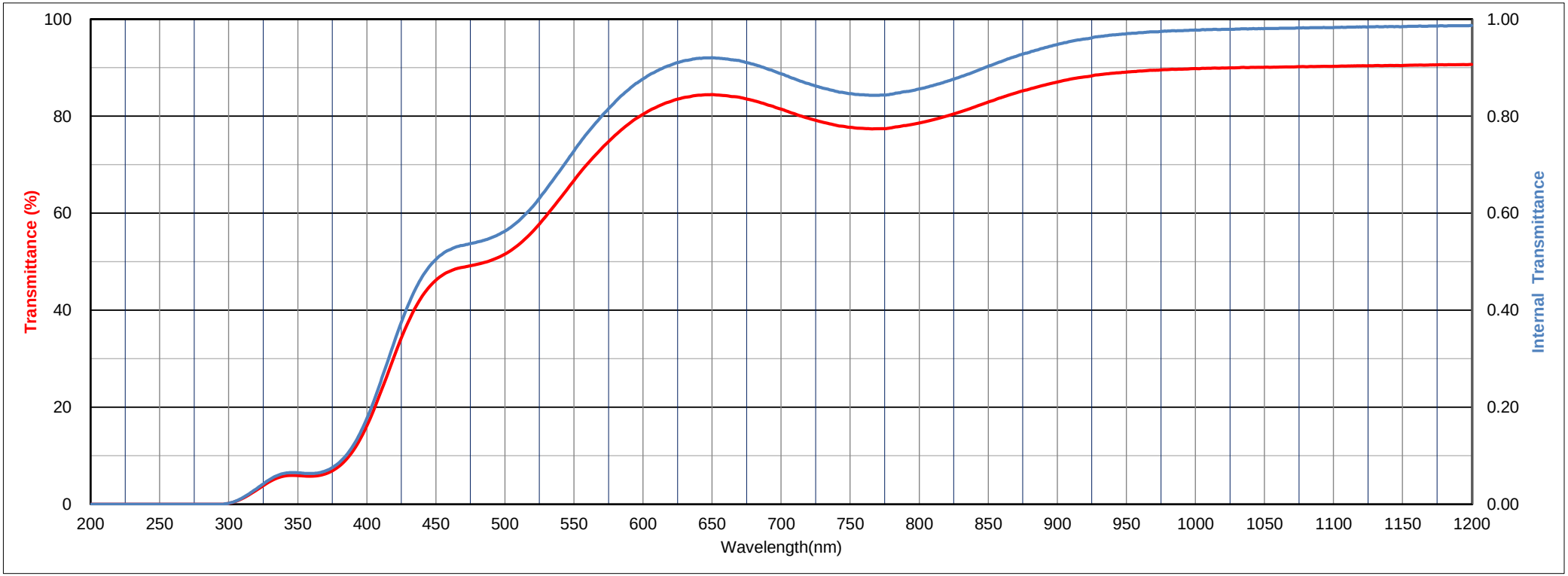
	x	y	Y	λ_d	P_e
A	0.490	0.415	72	589	34
C	0.364	0.358	68	581	26
D65	0.366	0.369	68	581	26

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	510	560	100	113	530	130	2.67

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
80±5



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HOYA

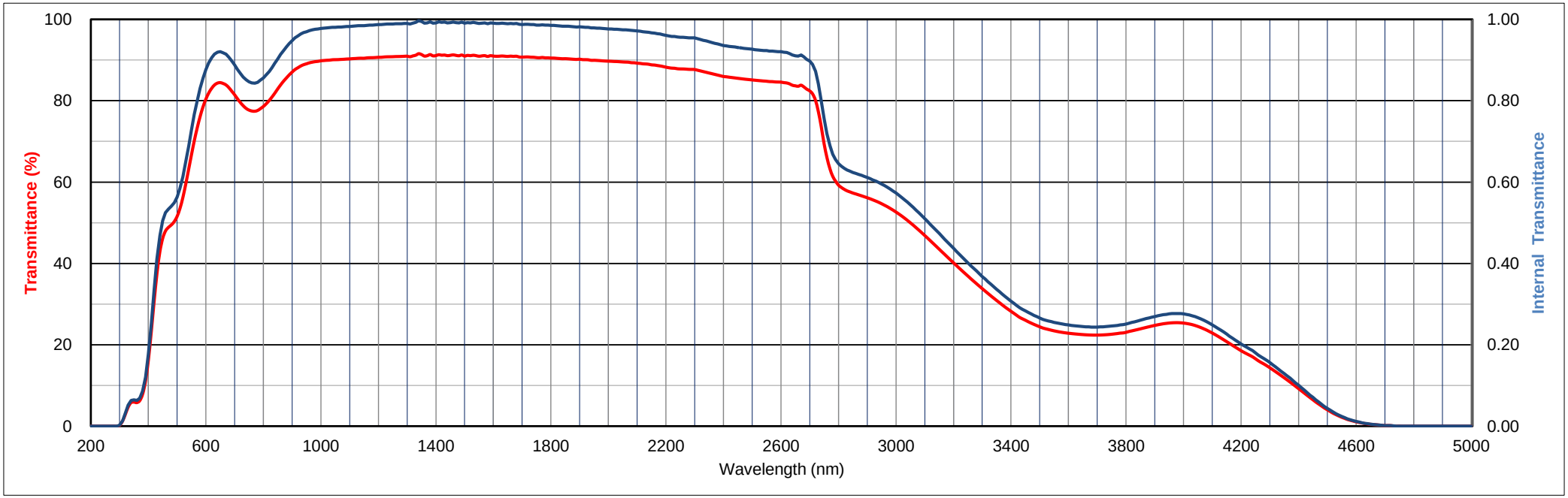
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA80

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.9	4.7	5.8	5.9	5.8	6.3	7.8	11.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	16.2	23.1	30.6	37.6	42.9	46.2	48.0	48.9	49.5	50.3	51.6	53.5	56.2	59.5	63.1	66.7	70.2	73.3	76.1	78.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	80.4	81.9	83.0	83.9	84.3	84.4	84.2	83.9	83.2	82.3	81.5	80.5	79.6	78.8	78.1	77.7	77.5	77.4	77.6	78.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	78.6	79.3	80.0	80.9	81.9	82.9	83.9	84.8	85.6	86.4	87.0	87.7	88.1	88.5	88.9	89.1	89.3	89.5	89.6	89.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.8	89.9	89.9	90.0	90.1	90.1	90.1	90.2	90.2	90.3	90.3	90.3	90.4	90.4	90.5	90.4	90.5	90.6	90.6	90.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.7	90.7	90.8	90.8	90.8	90.8	90.9	90.9	90.9	90.9	90.9	90.8	91.0	91.2	91.6	91.4	91.0	91.1	91.3	91.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	91.1	91.3	91.2	91.2	91.1	91.2	91.3	91.1	91.1	91.2	91.0	91.1	91.1	91.2	91.1	90.9	91.0	91.1	90.9	91.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	91.0	90.9	90.9	91.0	90.9	90.9	91.0	90.9	90.9	90.7	90.7	90.7	90.8	90.7	90.7	90.6	90.6	90.6	90.5	90.5
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	90.5	90.5	90.4	90.4	90.3	90.3	90.3	90.2	90.2	90.2	90.2	90.1	90.1	90.1	89.9	89.9	89.9	89.9	89.8	89.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.7	89.5	89.2	88.8	88.2	87.8	87.7	86.8	86.0	85.5	85.1	84.8	84.6	83.7	82.4	69.4	59.3	57.3	56.1	54.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	52.6	50.0	46.9	43.5	40.2	36.9	33.8	30.9	28.2	26.0	24.4	23.4	22.8	22.5	22.4	22.6	23.1	23.9	24.8	25.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	25.3	24.5	22.9	20.8	18.5	16.6	14.4	11.9	9.2	6.5	4.0	2.2	1.1	0.5	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

E-LA100

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	2.2	2.8	2.9	2.8	3.1	4.1	6.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.3	16.1	23.0	29.7	35.1	38.6	40.5	41.4	42.1	43.0	44.3	46.5	49.4	53.1	57.2	61.4	65.5	69.2	72.5	75.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	77.6	79.5	80.9	81.9	82.5	82.6	82.4	81.9	81.1	80.0	78.9	77.7	76.6	75.7	74.9	74.4	74.1	74.0	74.2	74.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	75.4	76.2	77.2	78.3	79.4	80.7	81.9	83.0	84.0	85.0	85.8	86.6	87.1	87.7	88.1	88.4	88.6	88.8	89.0	89.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	89.3	89.4	89.4	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.9	90.0	90.1	90.2	90.2	90.3				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.530	1.527	1.525	1.524	1.523	1.523	1.523
P	0.916	0.917	0.917	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

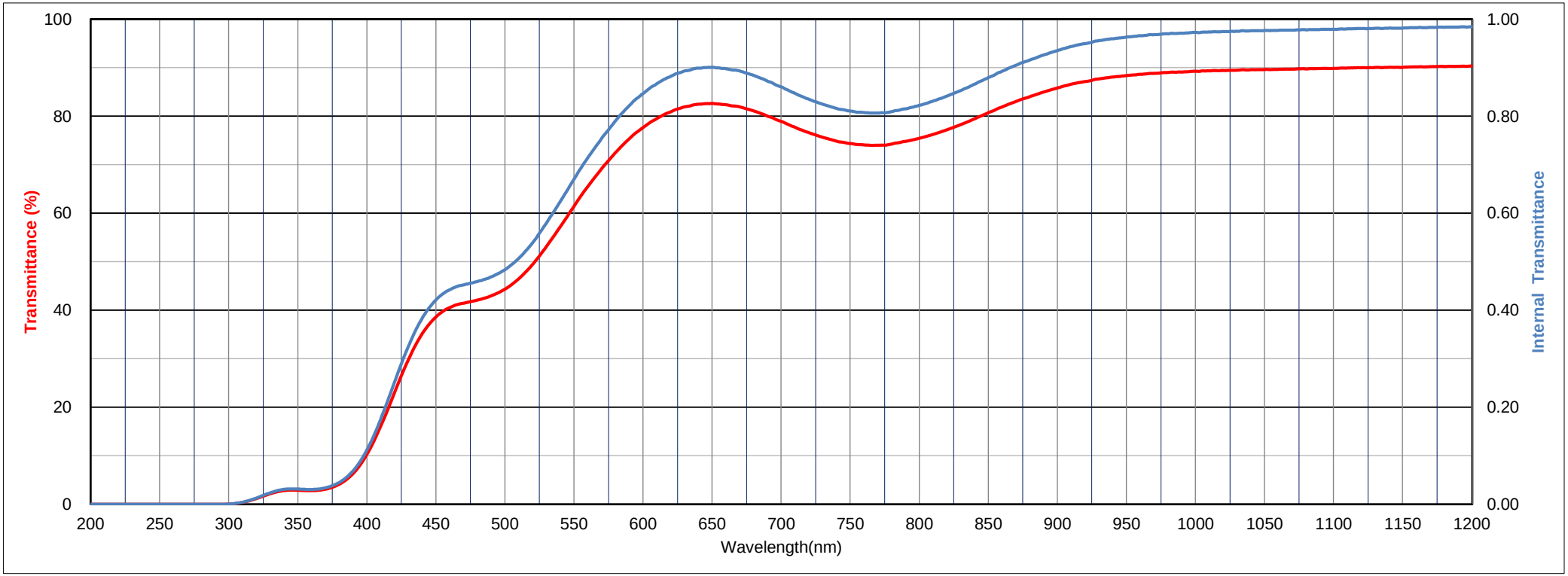
	x	y	Y	λ_d	P_e
A	0.500	0.415	67	590	42
C	0.378	0.367	63	582	32
D65	0.380	0.377	63	581	32

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	510	560	100	113	530	130	2.67

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
100±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

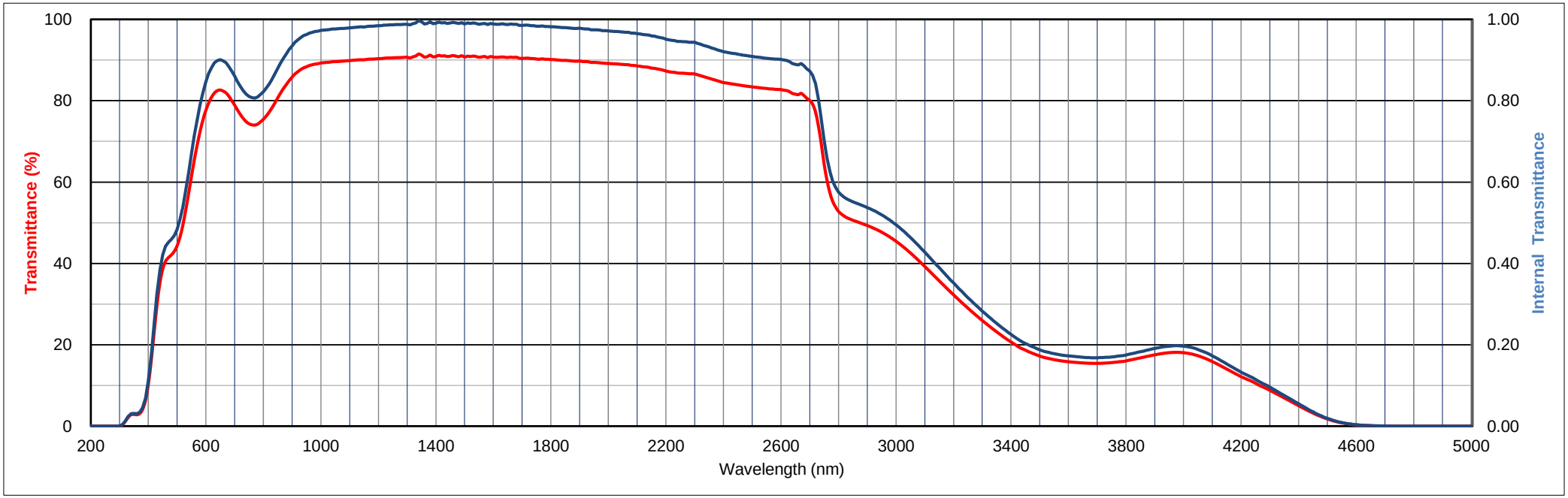
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA100

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.2	2.2	2.8	2.9	2.8	3.1	4.1	6.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.3	16.1	23.0	29.7	35.1	38.6	40.5	41.4	42.1	43.0	44.3	46.5	49.4	53.1	57.2	61.4	65.5	69.2	72.5	75.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	77.6	79.5	80.9	81.9	82.5	82.6	82.4	81.9	81.1	80.0	78.9	77.7	76.6	75.7	74.9	74.4	74.1	74.0	74.2	74.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	75.4	76.2	77.2	78.3	79.4	80.7	81.9	83.0	84.0	85.0	85.8	86.6	87.1	87.7	88.1	88.4	88.6	88.8	89.0	89.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	89.3	89.4	89.4	89.5	89.6	89.6	89.6	89.7	89.7	89.8	89.9	89.9	90.0	90.0	90.1	90.1	90.2	90.2	90.2	90.3
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.3	90.4	90.4	90.5	90.5	90.5	90.6	90.6	90.6	90.7	90.7	90.5	90.8	91.0	91.5	91.2	90.7	90.8	91.2	90.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.9	91.1	91.0	91.1	90.9	91.0	91.1	90.9	90.8	91.1	90.7	90.9	90.9	91.0	90.9	90.7	90.8	90.9	90.6	90.9
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.7	90.7	90.7	90.8	90.7	90.6	90.7	90.6	90.7	90.4	90.4	90.4	90.5	90.4	90.4	90.3	90.2	90.3	90.2	90.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	90.1	90.1	90.0	90.0	89.9	89.9	89.9	89.8	89.7	89.7	89.8	89.6	89.6	89.6	89.4	89.4	89.4	89.3	89.3	89.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	89.2	88.9	88.5	88.0	87.3	86.8	86.6	85.5	84.5	83.9	83.4	83.0	82.7	81.6	80.1	64.5	52.8	50.6	49.3	47.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	45.5	42.6	39.3	35.8	32.3	29.0	26.0	23.2	20.7	18.7	17.2	16.4	15.8	15.5	15.4	15.6	16.0	16.8	17.5	18.1
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	18.1	17.3	15.9	14.0	12.2	10.6	8.8	6.9	5.0	3.2	1.8	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

E-LA120

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.3	1.3	1.3	1.4	2.0	3.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	6.2	10.8	16.8	23.0	28.3	31.7	33.7	34.6	35.3	36.2	37.6	39.8	43.0	46.9	51.4	56.1	60.7	64.9	68.7	72.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.8	77.0	78.6	79.8	80.5	80.7	80.4	79.9	78.9	77.6	76.3	74.9	73.5	72.4	71.5	70.9	70.6	70.5	70.8	71.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	72.2	73.1	74.2	75.5	76.9	78.4	79.8	81.2	82.3	83.5	84.5	85.5	86.1	86.8	87.3	87.6	88.0	88.2	88.4	88.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	88.7	88.8	88.9	89.0	89.1	89.1	89.2	89.2	89.3	89.4	89.4	89.6	89.7	89.8	89.9	90.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.528	1.525	1.524	1.523	1.522	1.522	1.522
P	0.916	0.917	0.917	0.918	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

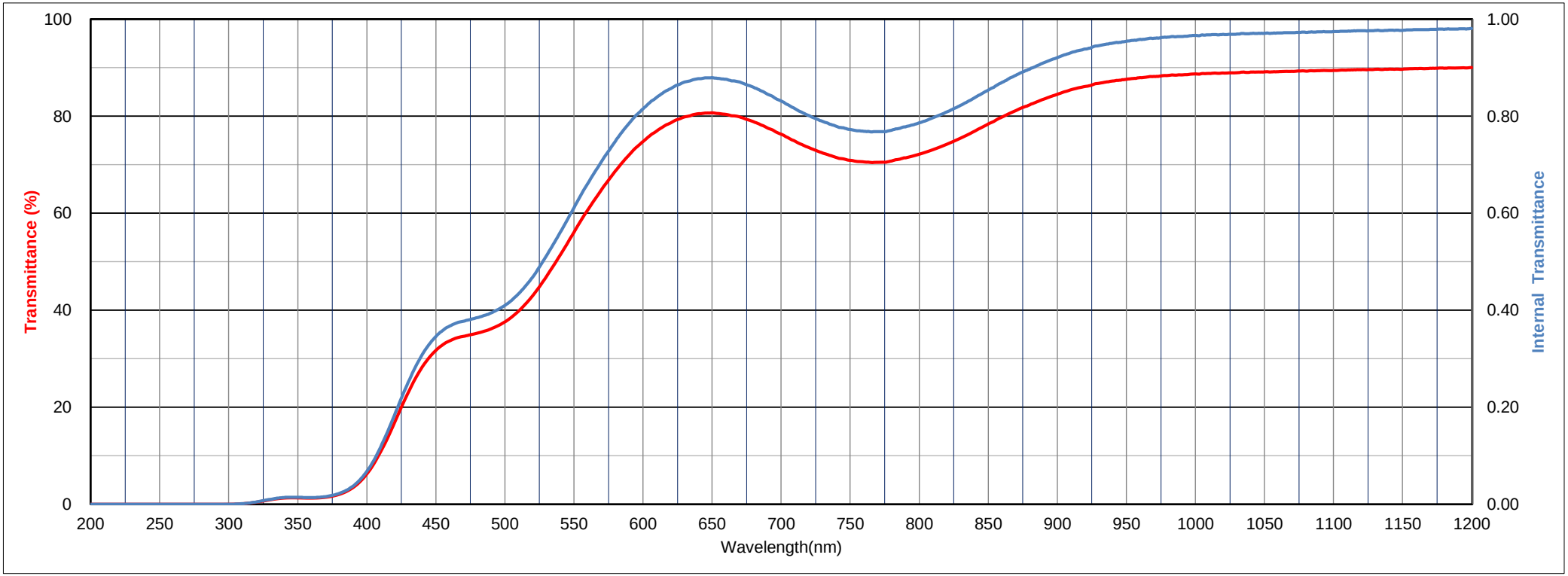
	x	y	Y	λ_d	P_e
A	0.510	0.415	63	590	49
C	0.393	0.375	58	582	38
D65	0.394	0.385	58	582	38

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	515	565	99	110	530	130	2.68

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
120±5



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The content of this catalog is accurate as of October ,2020

HOYA

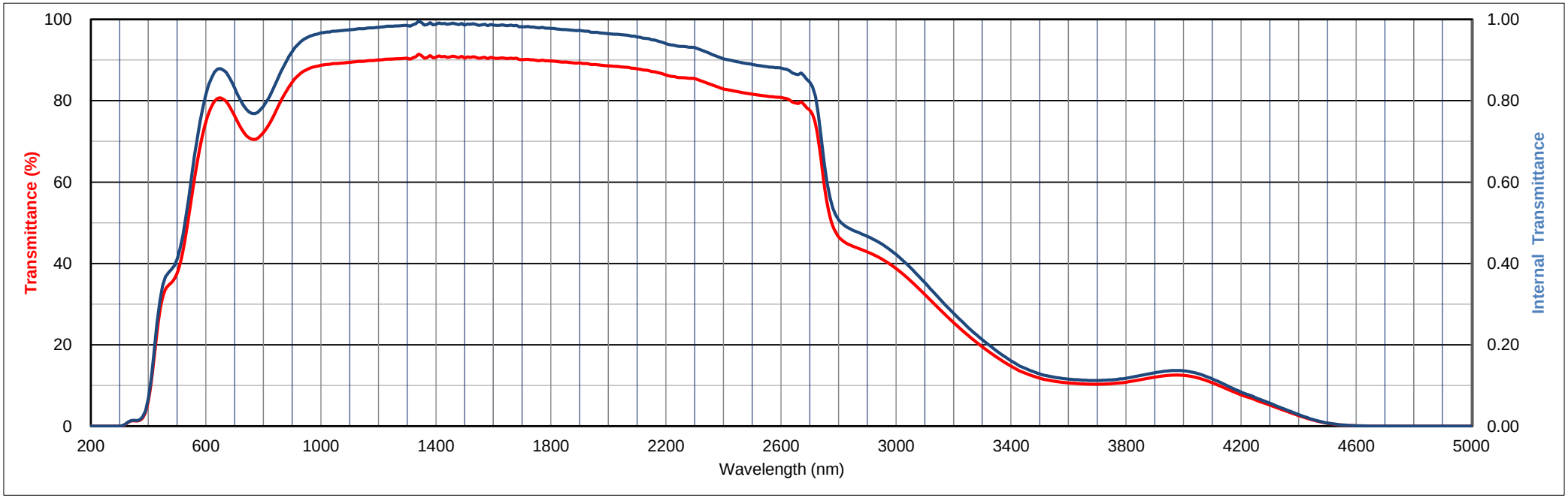
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA120

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.3	1.3	1.3	1.4	2.0	3.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	6.2	10.8	16.8	23.0	28.3	31.7	33.7	34.6	35.3	36.2	37.6	39.8	43.0	46.9	51.4	56.1	60.7	64.9	68.7	72.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.8	77.0	78.6	79.8	80.5	80.7	80.4	79.9	78.9	77.6	76.3	74.9	73.5	72.4	71.5	70.9	70.6	70.5	70.8	71.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	72.2	73.1	74.2	75.5	76.9	78.4	79.8	81.2	82.3	83.5	84.5	85.5	86.1	86.8	87.3	87.6	88.0	88.2	88.4	88.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	88.7	88.8	88.9	89.0	89.1	89.1	89.2	89.2	89.3	89.4	89.4	89.5	89.6	89.7	89.7	89.7	89.8	89.9	89.9	89.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	90.0	90.0	90.2	90.2	90.2	90.3	90.3	90.3	90.4	90.4	90.4	90.2	90.6	90.8	91.4	91.1	90.5	90.6	91.1	90.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.7	91.0	90.8	90.9	90.7	90.8	90.9	90.8	90.6	90.9	90.5	90.8	90.7	90.8	90.6	90.4	90.6	90.7	90.4	90.6
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.5	90.4	90.4	90.5	90.4	90.4	90.5	90.4	90.4	90.1	90.1	90.1	90.2	90.1	90.0	89.9	89.8	90.0	89.8	89.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.7	89.7	89.6	89.6	89.5	89.5	89.4	89.4	89.3	89.2	89.3	89.2	89.1	89.1	88.9	88.9	88.9	88.8	88.7	88.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.6	88.3	87.8	87.2	86.3	85.7	85.5	84.2	82.9	82.2	81.6	81.1	80.8	79.5	77.7	59.5	46.6	44.2	42.8	41.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	38.8	35.8	32.4	28.9	25.5	22.4	19.5	17.0	14.8	13.0	11.8	11.1	10.6	10.4	10.3	10.5	10.8	11.4	12.0	12.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	12.5	11.9	10.7	9.2	7.7	6.5	5.2	3.9	2.6	1.5	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

E-LA140

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6	0.6	0.6	0.7	1.0	1.9
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	3.8	7.2	12.2	17.8	22.6	26.0	27.9	28.8	29.5	30.3	31.8	34.0	37.2	41.3	46.0	51.1	56.1	60.8	65.1	68.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	71.9	74.5	76.4	77.8	78.5	78.8	78.4	77.8	76.6	75.2	73.7	72.0	70.5	69.3	68.2	67.5	67.2	67.1	67.4	68.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	69.0	70.0	71.3	72.7	74.4	76.1	77.8	79.3	80.7	82.0	83.2	84.3	85.1	85.9	86.4	86.8	87.2	87.5	87.8	87.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	88.1	88.3	88.4	88.4	88.6	88.6	88.7	88.8	88.8	88.9	89.0	89.2	89.3	89.4	89.5	89.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.528	1.525	1.524	1.523	1.522	1.522	1.522
P	0.916	0.917	0.917	0.918	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

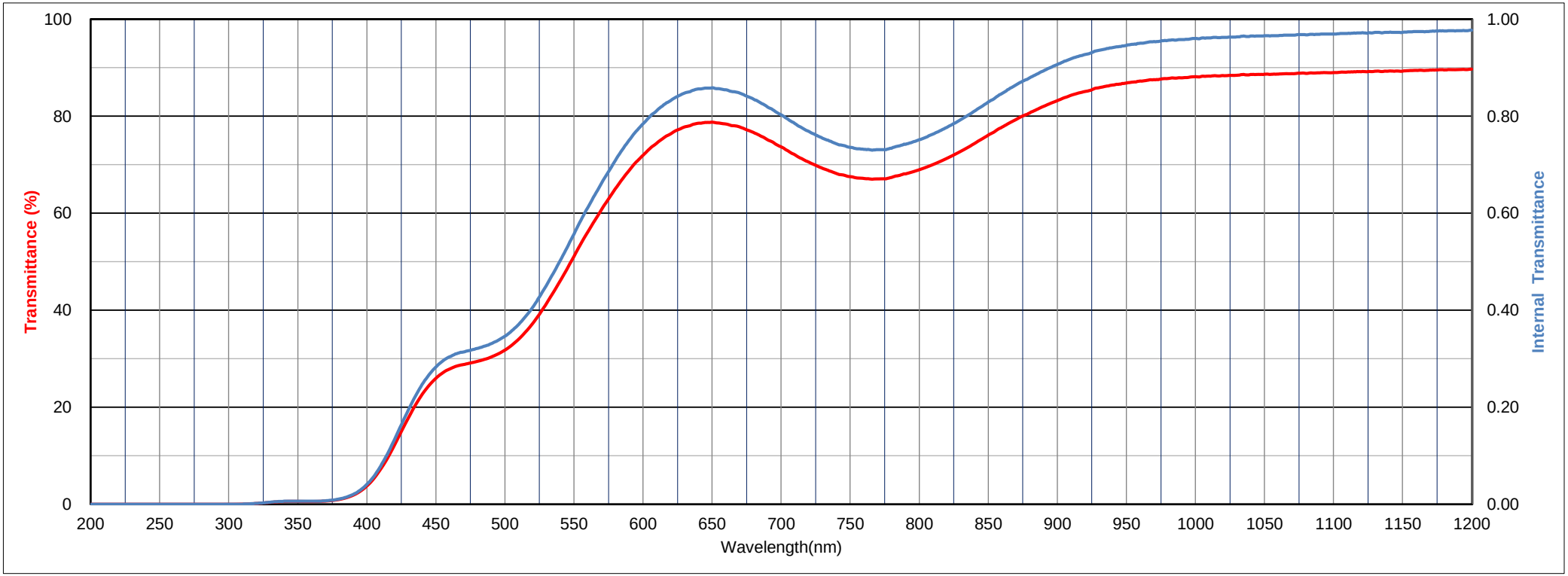
	x	y	Y	λ_d	P_e
A	0.519	0.415	59	591	55
C	0.408	0.383	54	583	44
D65	0.409	0.392	54	583	45

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	515	565	99	110	530	130	2.68

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
140±5



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The content of this catalog is accurate as of October ,2020

HOYA

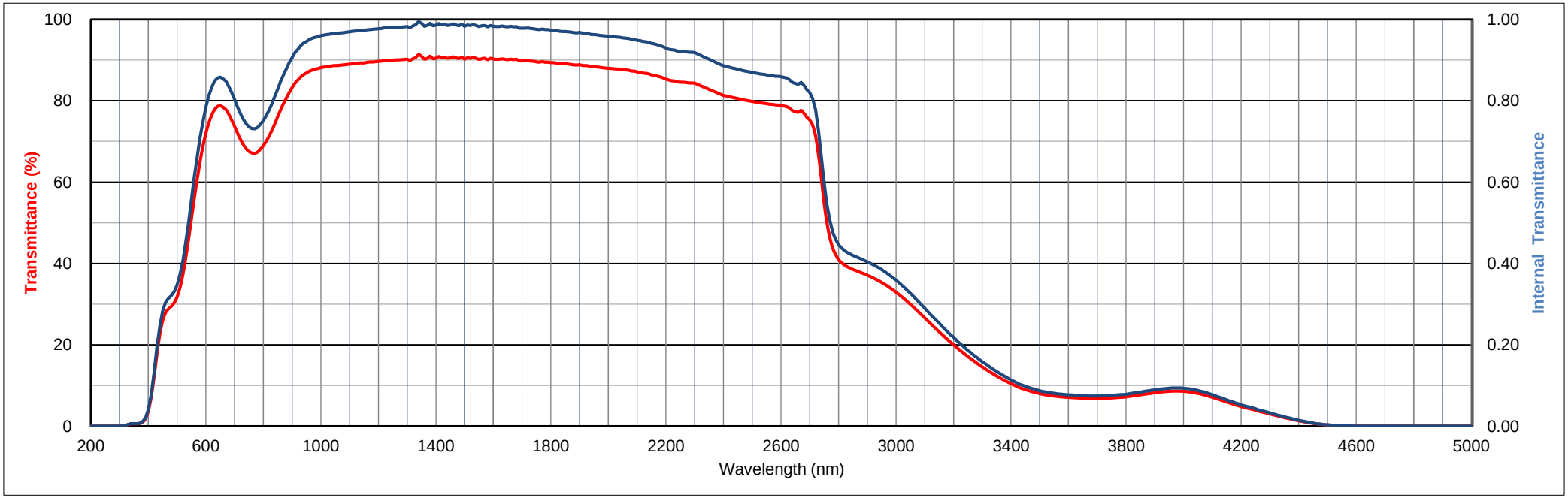
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA140

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.6	0.6	0.6	0.7	1.0	1.9
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	3.8	7.2	12.2	17.8	22.6	26.0	27.9	28.8	29.5	30.3	31.8	34.0	37.2	41.3	46.0	51.1	56.1	60.8	65.1	68.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	71.9	74.5	76.4	77.8	78.5	78.8	78.4	77.8	76.6	75.2	73.7	72.0	70.5	69.3	68.2	67.5	67.2	67.1	67.4	68.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	69.0	70.0	71.3	72.7	74.4	76.1	77.8	79.3	80.7	82.0	83.2	84.3	85.1	85.9	86.4	86.8	87.2	87.5	87.8	87.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	88.1	88.3	88.4	88.4	88.6	88.6	88.7	88.8	88.8	88.9	89.0	89.1	89.2	89.3	89.3	89.3	89.4	89.5	89.5	89.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	89.7	89.7	89.8	89.9	89.9	90.0	90.0	90.1	90.1	90.2	90.2	89.9	90.3	90.6	91.3	90.9	90.3	90.4	90.9	90.4
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.5	90.9	90.6	90.7	90.4	90.6	90.8	90.6	90.4	90.7	90.3	90.6	90.4	90.6	90.4	90.2	90.3	90.4	90.1	90.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	90.3	90.2	90.2	90.3	90.2	90.1	90.2	90.1	90.2	89.8	89.8	89.8	89.9	89.7	89.7	89.6	89.5	89.6	89.5	89.5
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	89.4	89.4	89.2	89.2	89.1	89.1	89.0	88.9	88.8	88.8	88.9	88.7	88.7	88.6	88.4	88.4	88.3	88.2	88.1	88.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	88.0	87.6	87.1	86.3	85.3	84.6	84.3	82.8	81.3	80.5	79.8	79.3	78.9	77.3	75.2	54.8	41.0	38.5	37.1	35.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	32.9	30.0	26.6	23.2	20.0	17.1	14.6	12.3	10.5	9.0	8.0	7.4	7.1	6.9	6.8	6.9	7.2	7.7	8.2	8.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	8.6	8.1	7.1	5.9	4.8	3.9	3.0	2.1	1.3	0.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA200

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.7	2.0	4.4	7.7	11.1	13.7	15.3	16.0	16.6	17.3	18.6	20.6	23.6	27.6	32.5	38.0	43.8	49.4	54.7	59.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	63.7	67.0	69.6	71.6	72.7	73.0	72.4	71.6	70.0	68.0	66.0	63.8	61.8	60.1	58.7	57.9	57.4	57.3	57.6	58.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	59.7	61.1	62.8	64.7	66.9	69.3	71.5	73.7	75.6	77.5	79.2	80.8	82.0	83.1	83.9	84.5	85.1	85.5	85.9	86.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	86.4	86.6	86.8	86.9	87.1	87.2	87.2	87.4	87.4	87.6	87.7	88.0	88.1	88.4	88.5	88.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.536	1.532	1.529	1.528	1.527	1.526	1.526
P	0.915	0.916	0.916	0.916	0.917	0.917	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

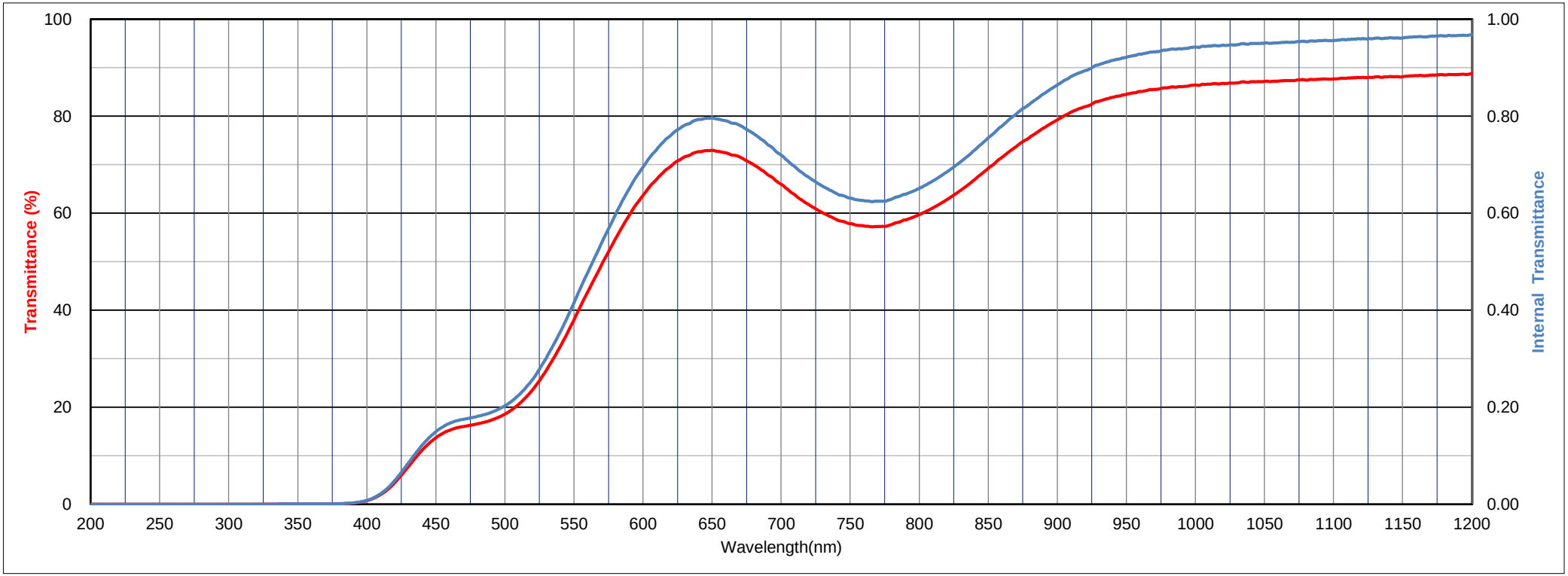
	x	y	Y	λ_d	P_e
A	0.546	0.411	49	592	70
C	0.452	0.401	43	585	61
D65	0.453	0.408	42	585	61

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	515	565	99	110	530	130	2.68

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
200±5



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The content of this catalog is accurate as of October ,2020

HOYA

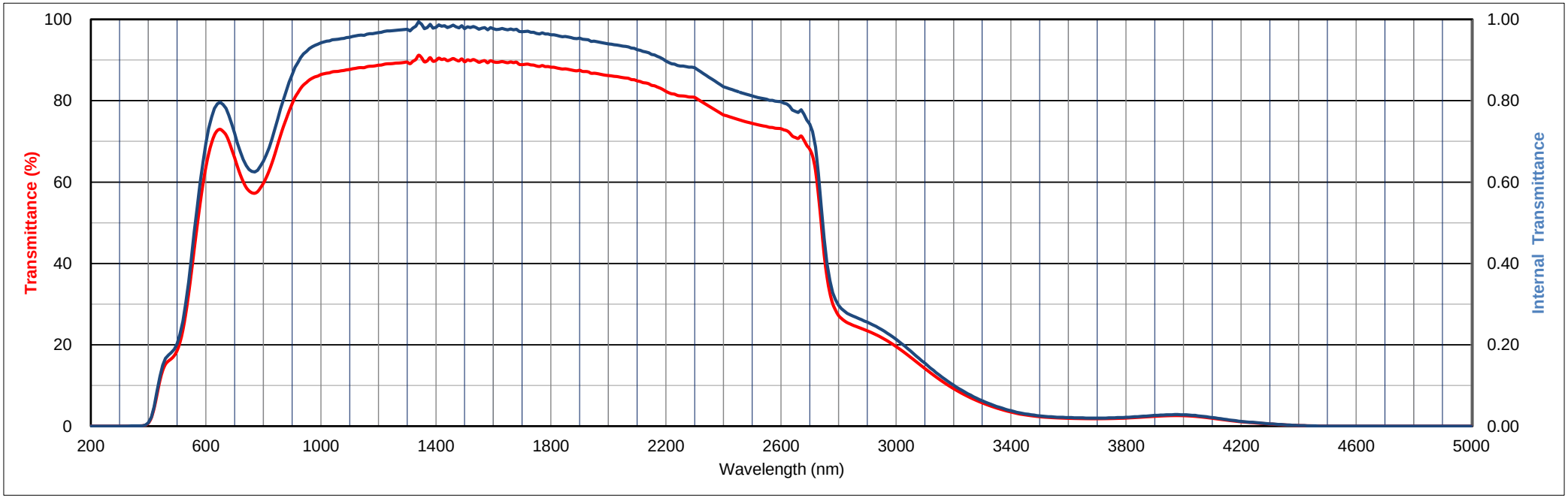
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

E-LA200

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.7	2.0	4.4	7.7	11.1	13.7	15.3	16.0	16.6	17.3	18.6	20.6	23.6	27.6	32.5	38.0	43.8	49.4	54.7	59.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	63.7	67.0	69.6	71.6	72.7	73.0	72.4	71.6	70.0	68.0	66.0	63.8	61.8	60.1	58.7	57.9	57.4	57.3	57.6	58.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	59.7	61.1	62.8	64.7	66.9	69.3	71.5	73.7	75.6	77.5	79.2	80.8	82.0	83.1	83.9	84.5	85.1	85.5	85.9	86.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	86.4	86.6	86.8	86.9	87.1	87.2	87.2	87.4	87.4	87.6	87.7	87.9	88.0	88.1	88.1	88.1	88.4	88.5	88.5	88.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	88.7	88.8	89.0	89.1	89.1	89.1	89.2	89.3	89.3	89.4	89.5	89.1	89.7	90.1	91.2	90.6	89.6	89.8	90.6	89.7
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	89.9	90.5	90.1	90.3	89.9	90.1	90.4	90.0	89.8	90.3	89.6	90.0	89.8	90.1	89.8	89.5	89.7	89.9	89.3	89.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.6	89.4	89.5	89.6	89.5	89.3	89.5	89.4	89.5	88.9	88.9	88.9	89.0	88.8	88.8	88.5	88.4	88.6	88.4	88.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	88.2	88.2	88.1	87.9	87.8	87.8	87.7	87.6	87.4	87.3	87.5	87.2	87.2	87.1	86.7	86.8	86.7	86.5	86.4	86.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	86.2	85.7	84.9	83.8	82.3	81.2	80.8	78.6	76.5	75.4	74.4	73.7	73.1	71.0	68.1	42.3	27.2	24.8	23.4	21.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	19.6	17.0	14.2	11.6	9.2	7.3	5.7	4.5	3.5	2.8	2.3	2.1	1.9	1.8	1.8	1.9	2.0	2.2	2.4	2.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	2.6	2.3	1.9	1.5	1.1	0.8	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB20

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	4.3	19.7	40.8	58.5	70.2	77.5	82.1	84.5	86.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	87.4	87.6	86.5	86.4	86.0	85.7	85.2	84.5	84.0	83.2	82.5	81.5	80.5	79.2	78.4	78.4	78.5	77.8	75.8	73.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	72.6	72.1	71.3	70.2	69.0	68.3	68.4	69.0	70.0	70.7	71.0	70.8	70.6	70.3	70.0	69.8	69.7	69.6	69.5	69.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	69.6	69.7	69.9	70.1	70.3	70.5	70.8	71.0	71.4	71.7	72.1	72.5	72.8	73.2	73.7	74.1	74.5	74.9	75.3	75.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	76.0	76.4	76.8	77.2	77.5	77.8	78.2	78.5	78.8	79.0	79.3	79.8	80.4	80.7	81.2	81.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.527	1.524	1.522	1.521	1.520	1.519	1.519
P	0.917	0.917	0.918	0.918	0.918	0.918	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

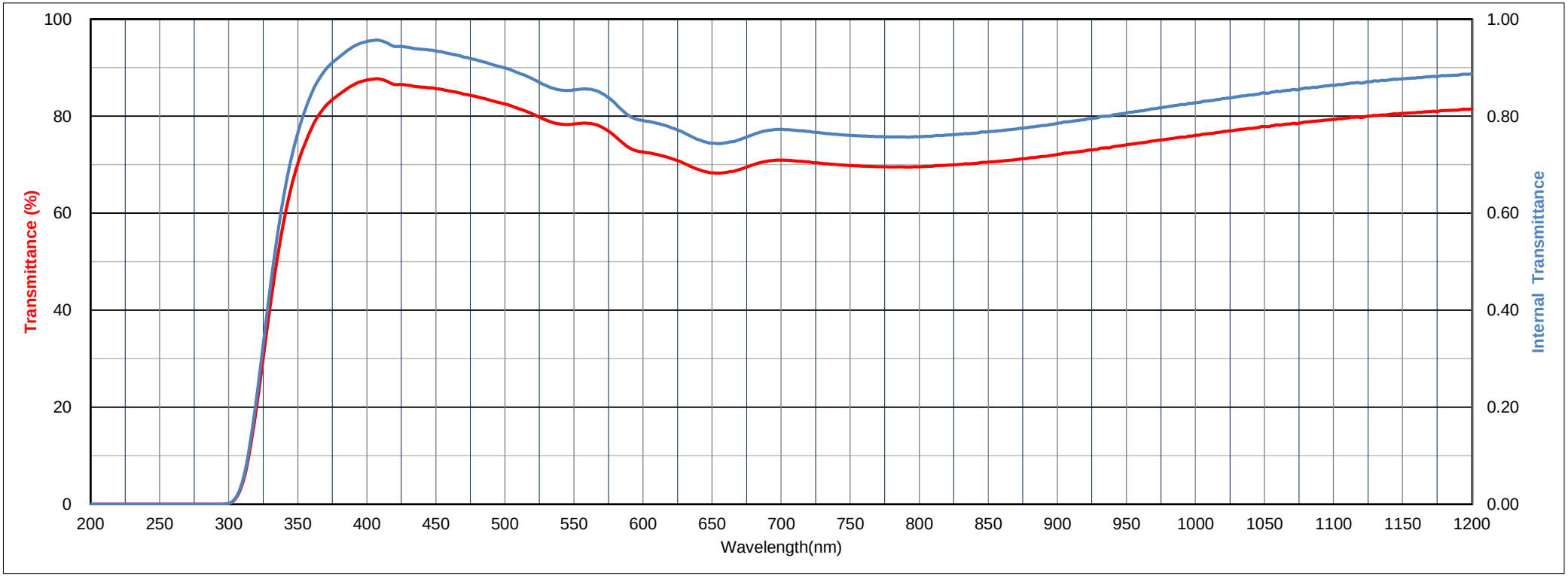
	x	y	Y	λ_d	P_e
A	0.433	0.406	76	493	4
C	0.296	0.306	77	482	6
D65	0.298	0.319	77	483	6

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	1	470	515	95	117	490	110	2.81

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-20±5



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HOYA

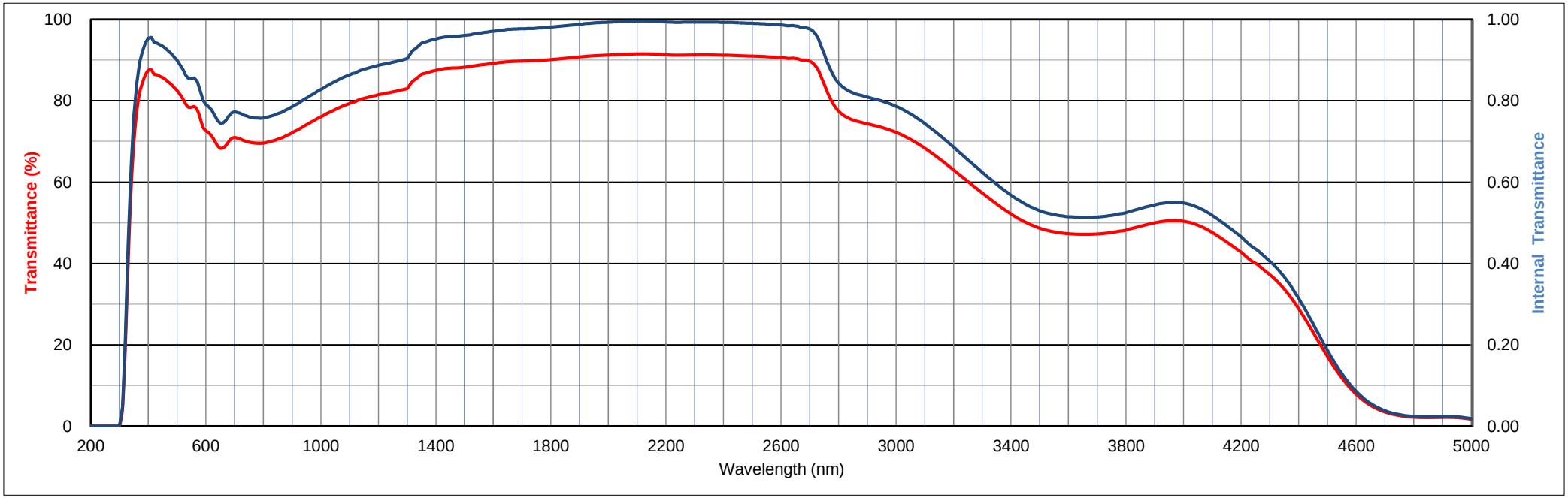
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB20

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	4.3	19.7	40.8	58.5	70.2	77.5	82.1	84.5	86.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	87.4	87.6	86.5	86.4	86.0	85.7	85.2	84.5	84.0	83.2	82.5	81.5	80.5	79.2	78.4	78.4	78.5	77.8	75.8	73.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	72.6	72.1	71.3	70.2	69.0	68.3	68.4	69.0	70.0	70.7	71.0	70.8	70.6	70.3	70.0	69.8	69.7	69.6	69.5	69.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	69.6	69.7	69.9	70.1	70.3	70.5	70.8	71.0	71.4	71.7	72.1	72.5	72.8	73.2	73.7	74.1	74.5	74.9	75.3	75.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	76.0	76.4	76.8	77.2	77.5	77.8	78.2	78.5	78.8	79.0	79.3	79.6	79.8	80.1	80.4	80.6	80.7	81.0	81.2	81.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	81.5	81.6	81.7	81.9	82.0	82.2	82.3	82.5	82.6	82.8	83.0	84.0	84.8	85.3	85.9	86.5	86.7	86.9	87.1	87.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	87.4	87.6	87.7	87.9	88.0	88.0	88.0	88.1	88.1	88.2	88.2	88.3	88.4	88.5	88.6	88.7	88.8	88.9	89.0	89.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.2	89.3	89.4	89.5	89.5	89.6	89.6	89.7	89.7	89.7	89.8	89.8	89.8	89.8	89.8	89.8	89.9	89.9	90.0	90.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	90.1	90.2	90.2	90.3	90.4	90.4	90.5	90.6	90.6	90.7	90.8	90.8	90.9	91.0	91.0	91.1	91.1	91.1	91.2	91.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	91.2	91.4	91.5	91.5	91.3	91.2	91.3	91.3	91.2	91.1	91.0	90.8	90.6	90.4	89.7	84.1	77.5	75.3	74.3	73.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	72.2	70.5	68.3	65.8	63.0	60.1	57.3	54.6	52.2	50.2	48.7	47.8	47.3	47.2	47.2	47.6	48.2	49.1	50.0	50.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	50.4	49.4	47.6	45.3	42.8	40.1	37.2	33.7	28.9	23.2	17.2	11.9	7.9	5.1	3.5	2.6	2.2	2.1	2.2	2.1
λnm	5000																			
T	1.7																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB40

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.7	19.2	38.8	55.5	67.5	75.5	80.0	83.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.5	85.7	83.6	83.2	82.4	81.8	80.8	79.7	78.5	77.0	75.7	73.9	71.9	69.7	68.2	68.2	68.5	67.1	63.8	60.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	58.5	57.7	56.5	54.8	52.9	51.8	51.9	52.8	54.4	55.6	55.9	55.6	55.2	54.8	54.4	54.1	53.9	53.7	53.6	53.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	53.7	53.9	54.2	54.5	54.7	55.1	55.5	55.9	56.5	56.9	57.5	58.1	58.7	59.2	60.0	60.6	61.2	61.8	62.5	63.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	63.7	64.3	64.9	65.5	66.1	66.7	67.1	67.7	68.3	68.7	69.2	70.0	70.9	71.6	72.3	72.9				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.530	1.516	1.509	1.505	1.502	1.500	1.499
P	0.916	0.919	0.921	0.922	0.923	0.923	0.923

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

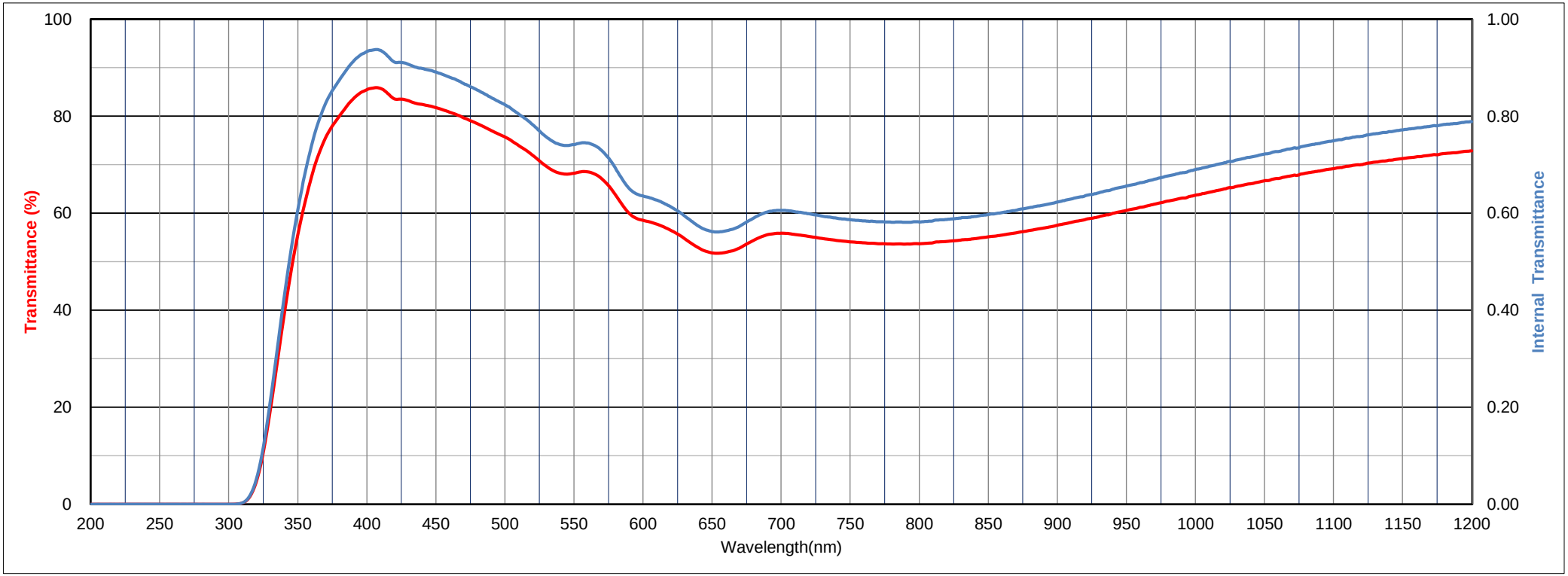
	x	y	Y	λ_d	P_e
A	0.417	0.404	64	493	7
C	0.282	0.295	67	481	13
D65	0.285	0.309	67	482	12

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	460	515	92	115	490	110	2.81

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-40±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

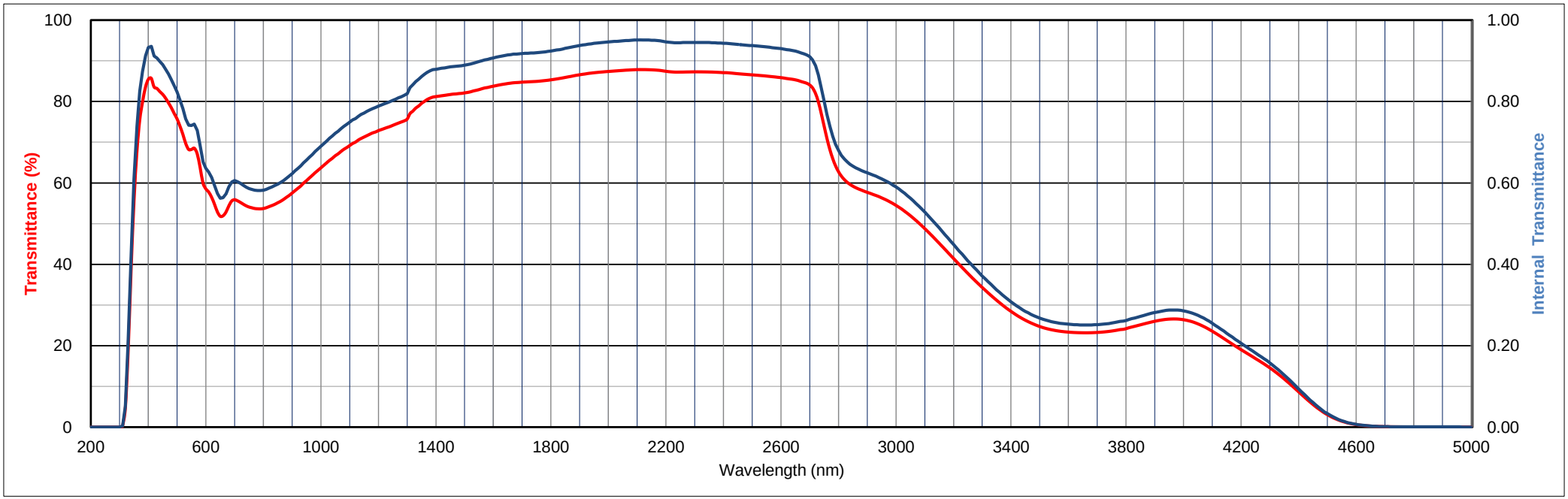
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB40

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.7	19.2	38.8	55.5	67.5	75.5	80.0	83.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.5	85.7	83.6	83.2	82.4	81.8	80.8	79.7	78.5	77.0	75.7	73.9	71.9	69.7	68.2	68.2	68.5	67.1	63.8	60.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	58.5	57.7	56.5	54.8	52.9	51.8	51.9	52.8	54.4	55.6	55.9	55.6	55.2	54.8	54.4	54.1	53.9	53.7	53.6	53.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	53.7	53.9	54.2	54.5	54.7	55.1	55.5	55.9	56.5	56.9	57.5	58.1	58.7	59.2	60.0	60.6	61.2	61.8	62.5	63.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	63.7	64.3	64.9	65.5	66.1	66.7	67.1	67.7	68.3	68.7	69.2	69.7	70.0	70.5	70.9	71.3	71.6	72.0	72.3	72.5
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	72.9	73.1	73.4	73.6	73.8	74.1	74.4	74.7	75.0	75.3	75.7	77.0	77.7	78.4	78.9	79.5	80.0	80.5	80.8	81.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	81.2	81.3	81.4	81.5	81.6	81.7	81.8	81.9	82.0	82.0	82.1	82.2	82.4	82.6	82.7	82.9	83.1	83.3	83.5	83.6
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	83.8	83.9	84.1	84.2	84.3	84.4	84.5	84.6	84.7	84.7	84.8	84.8	84.8	84.9	84.9	84.9	85.0	85.1	85.2	85.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	85.3	85.4	85.5	85.7	85.8	85.9	86.1	86.2	86.3	86.5	86.6	86.7	86.8	86.9	87.0	87.1	87.1	87.2	87.3	87.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	87.4	87.6	87.8	87.8	87.4	87.2	87.3	87.3	87.1	86.8	86.6	86.3	85.9	85.3	84.1	74.0	62.8	59.2	57.7	56.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	54.5	51.9	48.8	45.2	41.5	37.8	34.3	31.2	28.4	26.3	24.7	23.8	23.3	23.2	23.3	23.6	24.2	25.1	26.0	26.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	26.4	25.4	23.6	21.3	19.0	16.9	14.6	11.8	8.7	5.6	3.1	1.5	0.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB80

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	6.6	21.3	39.0	54.5	65.9	73.0	78.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	81.9	82.2	78.4	77.3	75.5	73.9	71.9	69.8	67.7	65.6	63.5	61.0	58.2	55.0	52.9	52.5	52.5	50.3	46.0	41.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	39.1	37.7	35.8	33.5	31.1	29.6	29.2	29.6	30.5	31.1	31.0	30.4	29.8	29.2	28.7	28.3	28.0	27.8	27.7	27.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	27.7	27.9	28.2	28.4	28.8	29.2	29.6	30.2	30.7	31.3	32.0	32.7	33.5	34.3	35.1	35.9	36.7	37.6	38.5	39.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	40.3	41.2	42.0	42.9	43.8	44.6	45.5	46.3	47.1	47.9	48.7	50.2	51.8	53.0	54.3	55.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.553	1.545	1.541	1.538	1.537	1.535	1.535
P	0.910	0.912	0.913	0.914	0.914	0.915	0.915

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

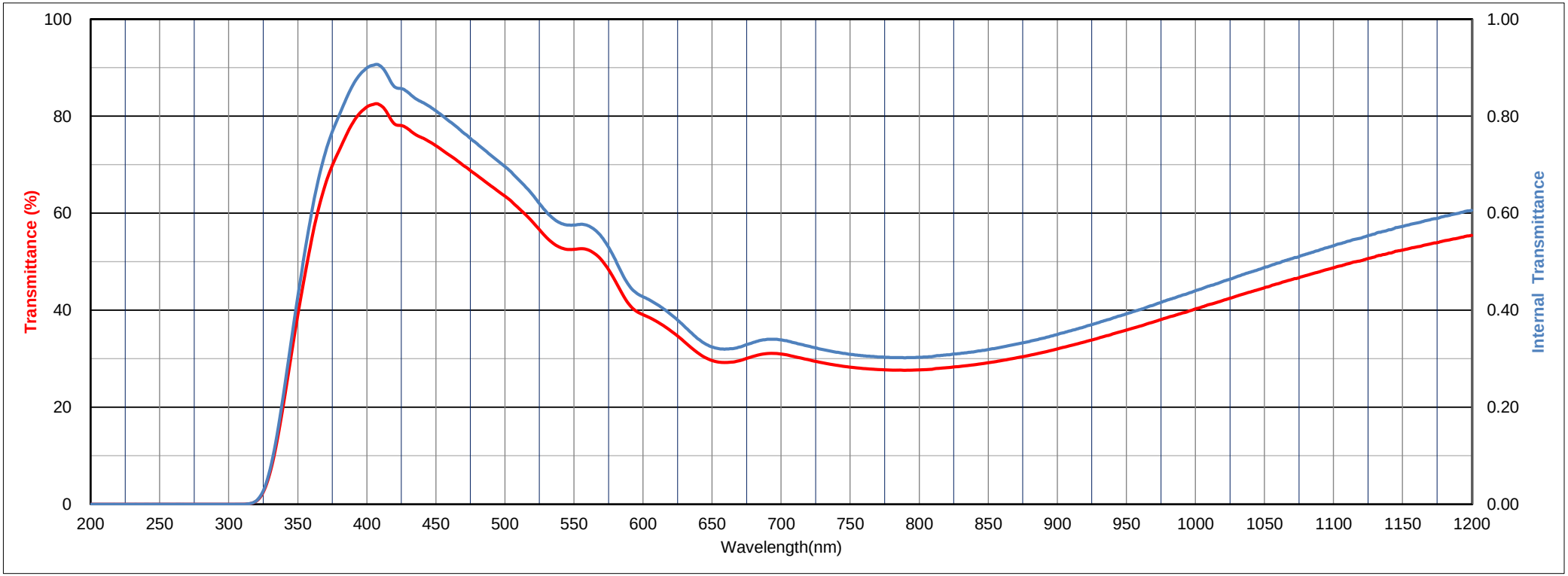
	x	y	Y	λ_d	P_e
A	0.388	0.398	47	492	15
C	0.258	0.275	50	481	23
D65	0.261	0.289	51	482	23

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	460	510	99	116	490	110	2.83

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-80±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

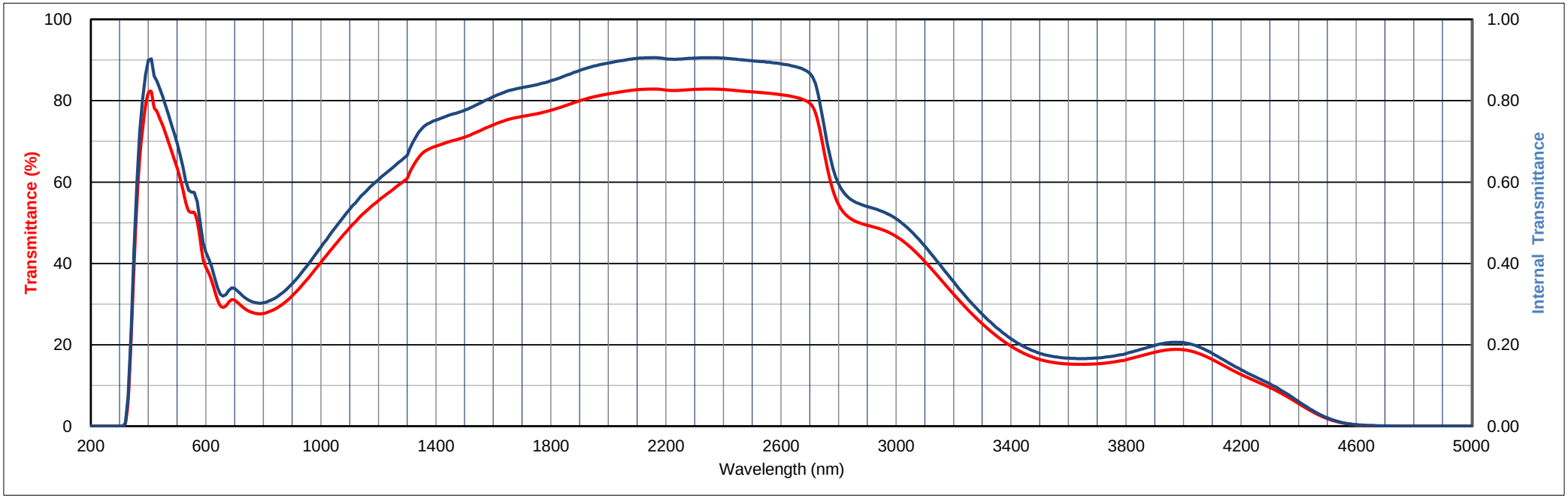
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB80

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	6.6	21.3	39.0	54.5	65.9	73.0	78.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	81.9	82.2	78.4	77.3	75.5	73.9	71.9	69.8	67.7	65.6	63.5	61.0	58.2	55.0	52.9	52.5	52.5	50.3	46.0	41.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	39.1	37.7	35.8	33.5	31.1	29.6	29.2	29.6	30.5	31.1	31.0	30.4	29.8	29.2	28.7	28.3	28.0	27.8	27.7	27.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	27.7	27.9	28.2	28.4	28.8	29.2	29.6	30.2	30.7	31.3	32.0	32.7	33.5	34.3	35.1	35.9	36.7	37.6	38.5	39.4
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	40.3	41.2	42.0	42.9	43.8	44.6	45.5	46.3	47.1	47.9	48.7	49.6	50.2	51.0	51.8	52.4	53.0	53.7	54.3	54.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	55.4	56.0	56.5	57.1	57.6	58.1	58.7	59.3	59.8	60.3	60.9	62.5	63.8	65.0	66.0	66.9	67.5	67.9	68.3	68.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	68.8	69.1	69.3	69.5	69.8	70.0	70.2	70.4	70.6	70.8	71.1	71.3	71.6	71.9	72.2	72.5	72.8	73.2	73.5	73.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	74.1	74.4	74.6	74.9	75.1	75.4	75.5	75.7	75.9	76.0	76.1	76.3	76.4	76.5	76.7	76.8	76.9	77.1	77.3	77.5
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	77.7	77.9	78.1	78.3	78.5	78.8	79.0	79.3	79.5	79.8	80.0	80.2	80.4	80.6	80.8	81.0	81.1	81.3	81.4	81.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	81.7	82.3	82.7	82.9	82.6	82.6	82.8	82.9	82.8	82.5	82.2	81.9	81.5	80.9	79.4	67.5	54.5	50.7	49.4	48.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	46.7	44.0	40.5	36.5	32.5	28.6	25.2	22.2	19.7	17.7	16.4	15.6	15.3	15.2	15.3	15.7	16.3	17.2	18.2	18.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	18.8	17.9	16.4	14.5	12.7	11.1	9.5	7.7	5.6	3.5	1.8	0.8	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB100

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	12.6	35.3	55.6	67.5	74.1	77.8	79.2	81.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	82.1	79.3	71.3	67.6	63.3	59.3	55.4	52.0	48.9	46.3	44.1	41.6	39.0	36.2	35.0	36.0	37.1	35.7	31.5	27.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	26.3	25.8	24.7	23.1	21.4	20.6	21.0	22.2	24.1	25.7	26.3	26.2	25.9	25.6	25.3	25.2	25.1	25.1	25.2	25.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	25.6	25.9	26.4	26.8	27.3	27.8	28.4	29.1	29.8	30.5	31.3	32.2	33.0	33.9	34.9	35.8	36.7	37.7	38.7	39.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	40.6	41.5	42.5	43.4	44.3	45.2	46.1	47.0	47.8	48.6	49.4	50.8	52.2	53.3	54.4	55.3				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.541	1.537	1.534	1.533	1.532	1.531	1.531
P	0.913	0.914	0.915	0.915	0.915	0.916	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

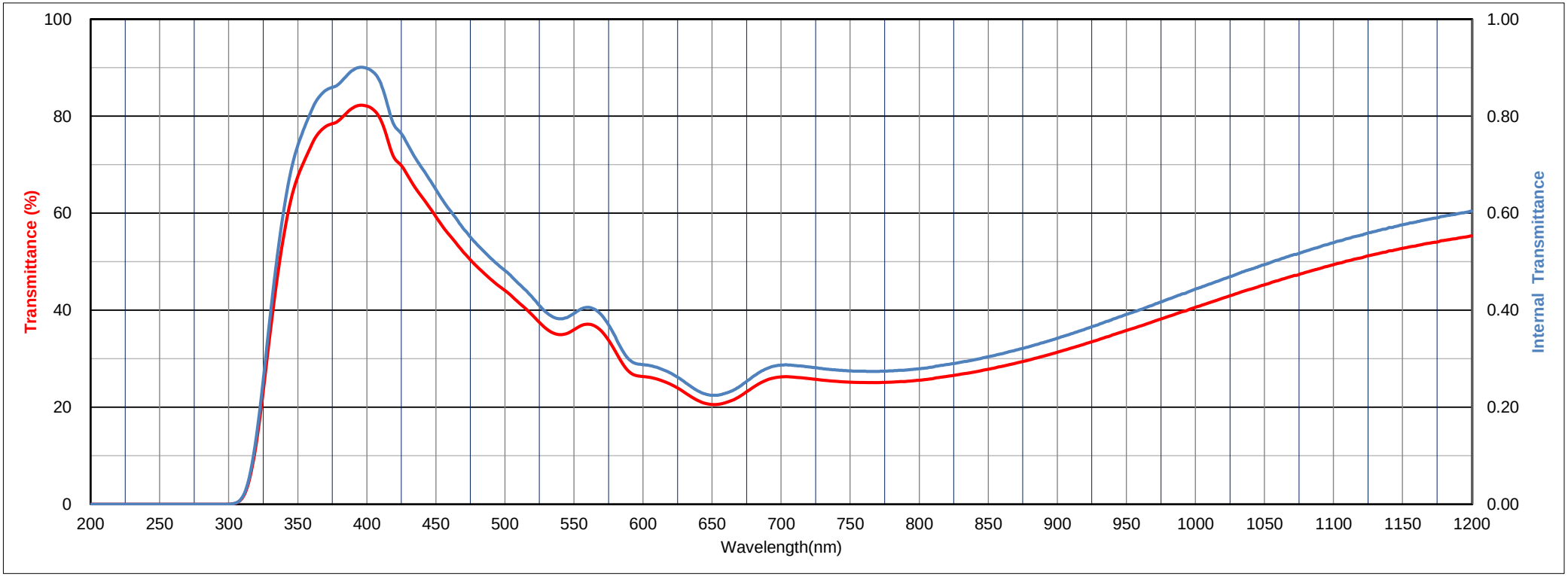
	x	y	Y	λ_d	P_e
A	0.380	0.384	32	489	17
C	0.250	0.252	35	476	29
D65	0.253	0.265	35	477	28

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	460	505	97	114	490	110	2.81

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-100±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

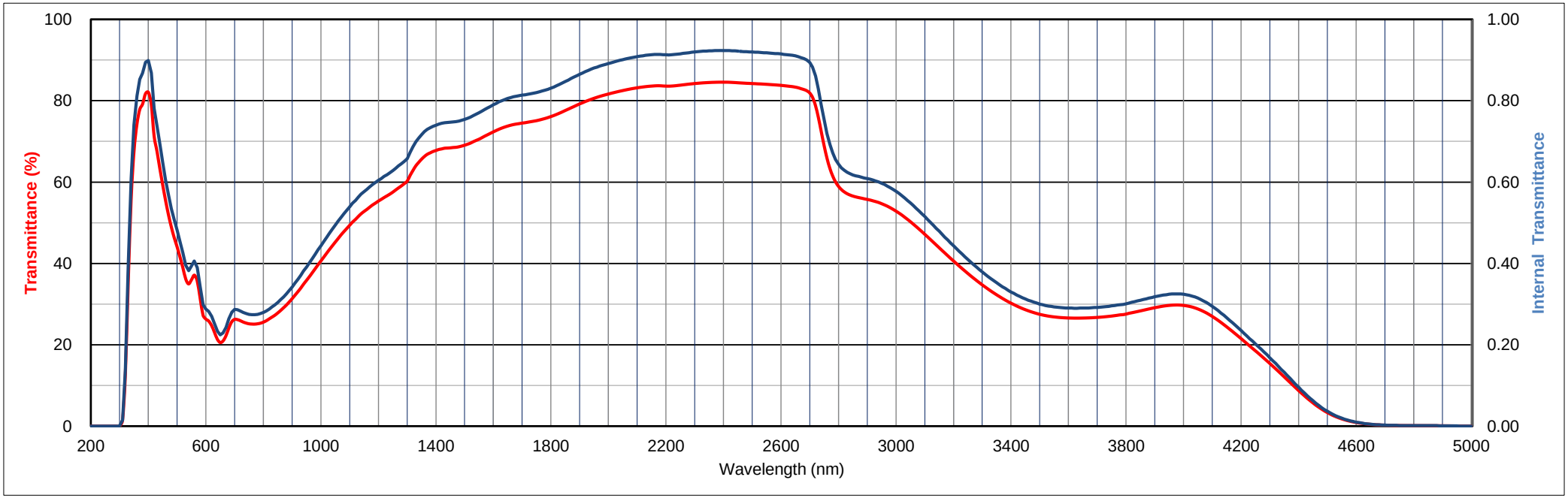
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB100

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	12.6	35.3	55.6	67.5	74.1	77.8	79.2	81.7
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	82.1	79.3	71.3	67.6	63.3	59.3	55.4	52.0	48.9	46.3	44.1	41.6	39.0	36.2	35.0	36.0	37.1	35.7	31.5	27.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	26.3	25.8	24.7	23.1	21.4	20.6	21.0	22.2	24.1	25.7	26.3	26.2	25.9	25.6	25.3	25.2	25.1	25.1	25.2	25.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	25.6	25.9	26.4	26.8	27.3	27.8	28.4	29.1	29.8	30.5	31.3	32.2	33.0	33.9	34.9	35.8	36.7	37.7	38.7	39.7
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	40.6	41.5	42.5	43.4	44.3	45.2	46.1	47.0	47.8	48.6	49.4	50.2	50.8	51.5	52.2	52.8	53.3	53.9	54.4	54.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	55.3	55.8	56.2	56.6	57.0	57.5	58.1	58.6	59.1	59.6	60.2	61.6	62.8	64.0	64.8	65.6	66.3	66.8	67.2	67.5
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	67.8	68.0	68.2	68.3	68.4	68.4	68.5	68.6	68.7	68.9	69.1	69.3	69.6	69.9	70.2	70.5	70.9	71.3	71.6	72.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	72.4	72.7	73.0	73.3	73.5	73.8	74.0	74.1	74.3	74.4	74.5	74.6	74.7	74.8	75.0	75.1	75.3	75.5	75.6	75.9
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	76.1	76.4	76.7	77.0	77.3	77.6	77.9	78.2	78.6	78.9	79.2	79.5	79.8	80.1	80.4	80.6	80.8	81.1	81.3	81.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	81.7	82.5	83.2	83.6	83.6	83.8	84.2	84.5	84.6	84.4	84.2	84.0	83.8	83.3	81.9	69.0	59.0	56.6	55.7	54.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	52.9	50.3	47.2	43.9	40.6	37.5	34.7	32.3	30.2	28.6	27.5	26.9	26.6	26.6	26.7	27.1	27.5	28.3	29.1	29.7
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	29.7	28.8	27.0	24.4	21.5	18.5	15.4	12.1	8.8	5.7	3.3	1.8	0.9	0.4	0.2	0.2	0.1	0.1	0.1	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB120

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	8.3	28.7	50.0	63.5	71.2	75.7	77.3	80.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	81.1	78.1	69.4	65.6	61.3	57.2	53.3	49.7	46.5	43.7	41.2	38.5	35.7	32.6	31.3	32.1	33.2	31.5	27.1	22.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	21.8	21.2	20.0	18.4	16.8	16.0	16.3	17.3	19.0	20.3	20.7	20.6	20.3	20.0	19.7	19.5	19.4	19.4	19.4	19.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	19.7	20.0	20.4	20.8	21.2	21.7	22.3	22.9	23.6	24.3	25.0	25.8	26.7	27.5	28.5	29.3	30.3	31.2	32.2	33.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	34.1	35.1	36.1	37.1	38.0	38.9	39.8	40.7	41.6	42.4	43.2	44.8	46.3	47.5	48.7	49.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.537	1.524	1.517	1.513	1.510	1.509	1.507
P	0.914	0.917	0.919	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

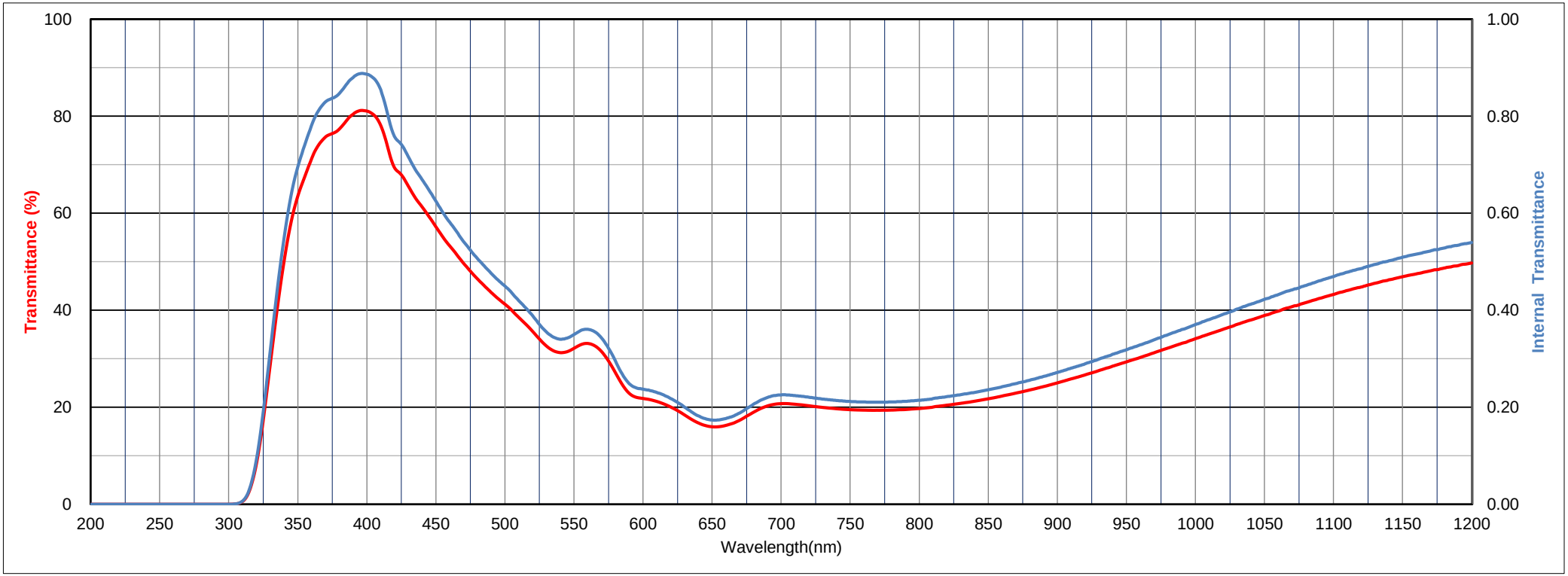
	x	y	Y	λ_d	P_e
A	0.365	0.379	28	489	21
C	0.240	0.242	31	476	34
D65	0.243	0.255	31	477	33

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	480	535	94	105	520	130	2.57

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-120±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

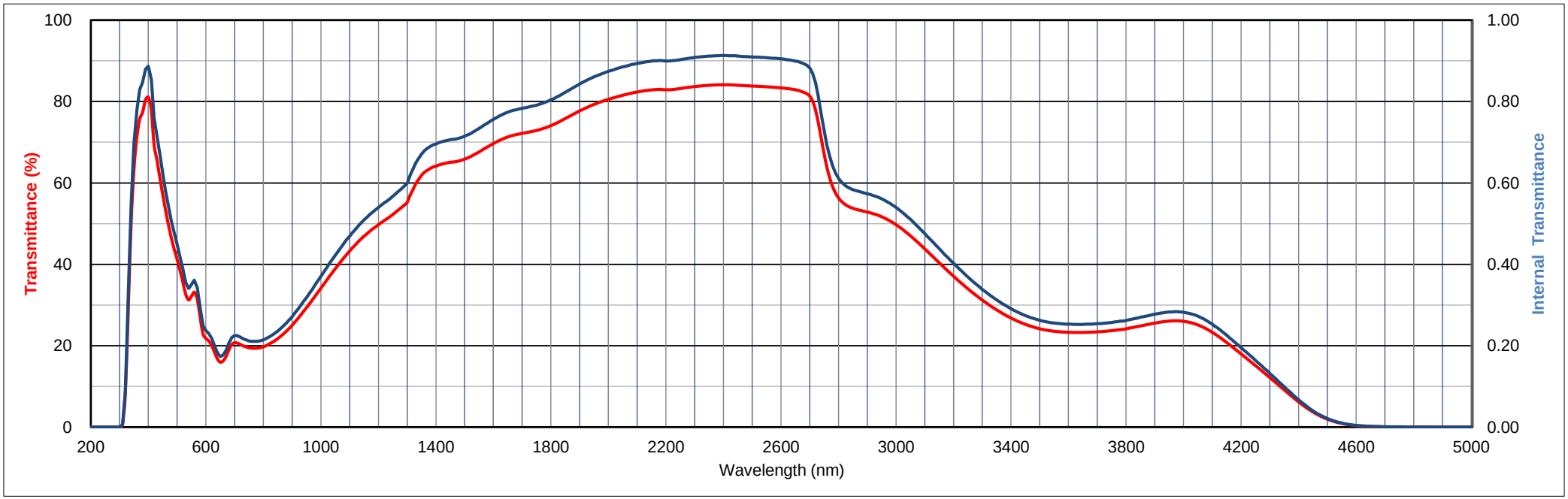
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB120

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	8.3	28.7	50.0	63.5	71.2	75.7	77.3	80.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	81.1	78.1	69.4	65.6	61.3	57.2	53.3	49.7	46.5	43.7	41.2	38.5	35.7	32.6	31.3	32.1	33.2	31.5	27.1	22.9
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	21.8	21.2	20.0	18.4	16.8	16.0	16.3	17.3	19.0	20.3	20.7	20.6	20.3	20.0	19.7	19.5	19.4	19.4	19.4	19.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	19.7	20.0	20.4	20.8	21.2	21.7	22.3	22.9	23.6	24.3	25.0	25.8	26.7	27.5	28.5	29.3	30.3	31.2	32.2	33.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	34.1	35.1	36.1	37.1	38.0	38.9	39.8	40.7	41.6	42.4	43.2	44.1	44.8	45.6	46.3	46.9	47.5	48.1	48.7	49.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	49.7	50.2	50.7	51.2	51.7	52.2	52.8	53.4	53.9	54.6	55.2	56.9	58.3	59.8	60.9	61.9	62.6	63.1	63.5	63.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	64.1	64.4	64.6	64.8	64.9	65.1	65.1	65.2	65.4	65.6	65.9	66.1	66.4	66.8	67.2	67.6	68.0	68.5	68.9	69.3
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	69.7	70.1	70.4	70.7	71.0	71.3	71.5	71.7	71.9	72.0	72.2	72.3	72.4	72.6	72.7	72.9	73.1	73.3	73.5	73.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	74.1	74.4	74.7	75.1	75.4	75.8	76.2	76.6	77.0	77.3	77.7	78.0	78.4	78.7	79.0	79.3	79.6	79.8	80.1	80.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	80.5	81.5	82.3	82.9	82.9	83.2	83.7	84.0	84.1	84.0	83.8	83.6	83.4	82.9	81.3	67.2	56.3	53.8	52.8	51.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	49.7	47.0	43.8	40.4	37.1	34.0	31.2	28.8	26.8	25.3	24.2	23.6	23.3	23.3	23.4	23.7	24.1	24.8	25.6	26.1
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	26.0	25.1	23.3	20.8	18.0	15.1	12.2	9.1	6.2	3.7	2.0	0.9	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB140

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.9	24.3	45.8	60.3	68.8	73.7	75.5	79.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	79.7	76.5	66.7	62.6	57.9	53.5	49.3	45.5	42.1	39.2	36.7	33.9	31.1	28.1	26.7	27.6	28.6	26.9	22.7	18.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	17.6	17.1	16.0	14.6	13.1	12.4	12.6	13.6	15.0	16.2	16.7	16.6	16.3	16.0	15.7	15.5	15.4	15.4	15.5	15.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	15.7	16.0	16.4	16.7	17.1	17.6	18.1	18.7	19.3	19.9	20.7	21.4	22.2	23.0	23.9	24.8	25.7	26.6	27.6	28.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	29.5	30.5	31.4	32.4	33.3	34.3	35.2	36.1	37.0	37.9	38.7	40.3	41.8	43.1	44.3	45.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.524	1.517	1.513	1.511	1.509	1.508	1.507
P	0.917	0.919	0.920	0.921	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

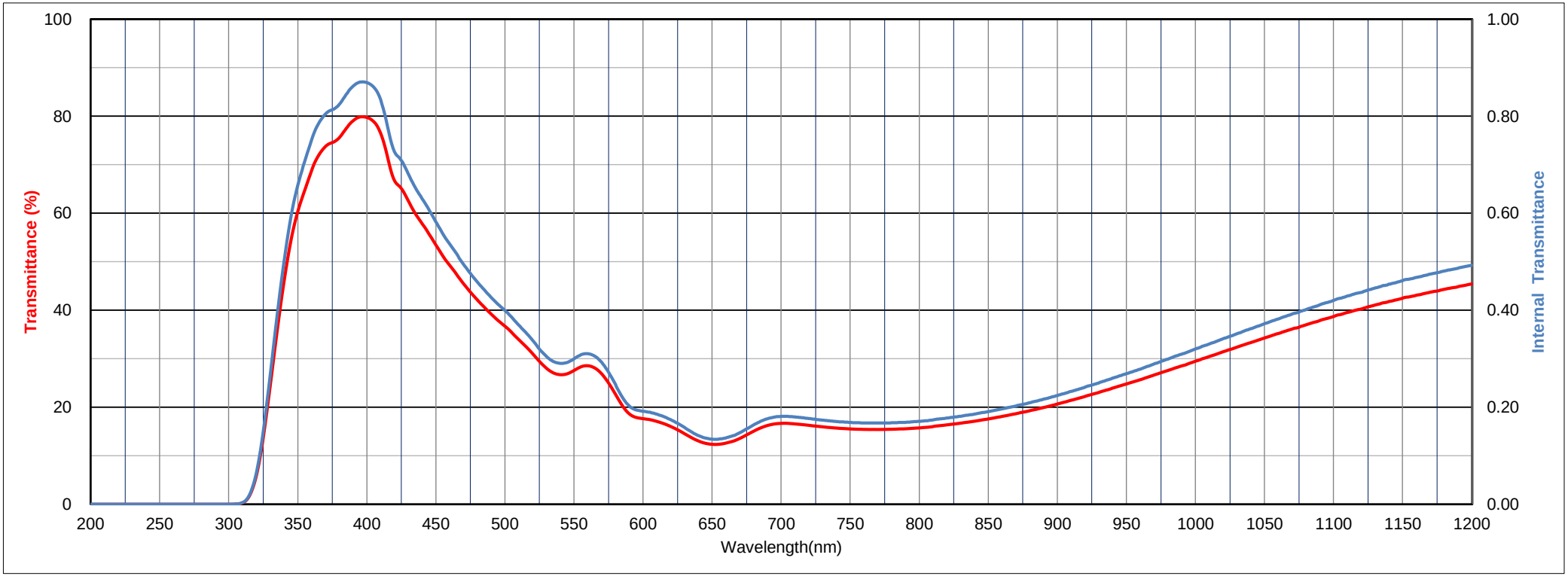
	x	y	Y	λ_d	P_e
A	0.353	0.372	24	488	24
C	0.232	0.230	26	476	38
D65	0.234	0.244	26	477	37

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	480	535	95	107	520	130	2.57

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-140±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

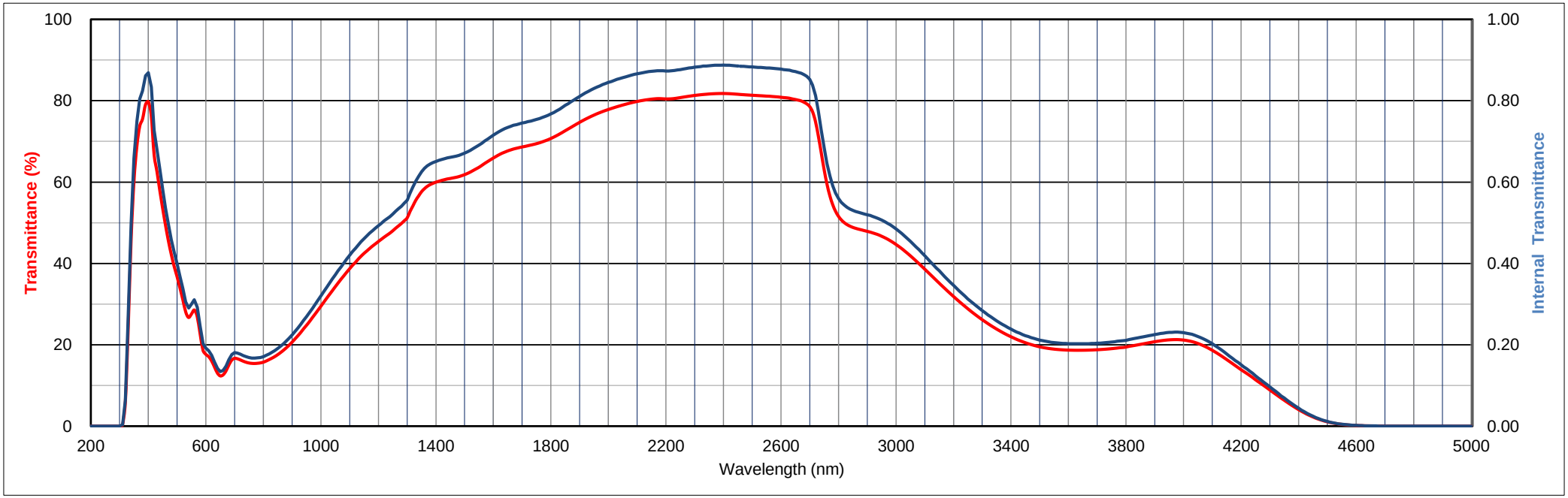
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB140

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	5.9	24.3	45.8	60.3	68.8	73.7	75.5	79.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	79.7	76.5	66.7	62.6	57.9	53.5	49.3	45.5	42.1	39.2	36.7	33.9	31.1	28.1	26.7	27.6	28.6	26.9	22.7	18.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	17.6	17.1	16.0	14.6	13.1	12.4	12.6	13.6	15.0	16.2	16.7	16.6	16.3	16.0	15.7	15.5	15.4	15.4	15.5	15.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	15.7	16.0	16.4	16.7	17.1	17.6	18.1	18.7	19.3	19.9	20.7	21.4	22.2	23.0	23.9	24.8	25.7	26.6	27.6	28.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	29.5	30.5	31.4	32.4	33.3	34.3	35.2	36.1	37.0	37.9	38.7	39.5	40.3	41.1	41.8	42.5	43.1	43.7	44.3	44.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	45.4	45.9	46.5	47.0	47.5	48.0	48.7	49.2	49.8	50.5	51.2	52.8	54.1	55.5	56.6	57.6	58.4	59.0	59.4	59.7
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	60.0	60.2	60.4	60.6	60.8	60.9	61.0	61.2	61.4	61.6	61.8	62.1	62.5	62.9	63.3	63.6	64.1	64.6	65.0	65.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	65.9	66.3	66.7	67.1	67.4	67.7	67.9	68.1	68.3	68.5	68.6	68.8	68.9	69.1	69.3	69.4	69.7	69.9	70.1	70.4
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	70.7	71.1	71.4	71.8	72.2	72.6	73.0	73.5	73.9	74.3	74.7	75.1	75.5	75.8	76.2	76.5	76.8	77.1	77.4	77.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	77.8	78.9	79.8	80.4	80.4	80.8	81.3	81.7	81.8	81.6	81.3	81.1	80.8	80.3	78.6	63.1	51.6	48.9	47.9	46.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	44.7	41.9	38.6	35.2	31.9	28.9	26.2	23.9	22.0	20.5	19.5	18.9	18.7	18.7	18.8	19.1	19.4	20.1	20.8	21.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	21.2	20.3	18.6	16.4	13.9	11.4	8.9	6.4	4.1	2.3	1.1	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (−) mm

LB200

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	13.1	31.3	46.8	57.1	63.8	67.0	71.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	72.6	68.7	56.7	51.1	45.1	39.6	34.8	30.8	27.5	24.9	22.7	20.5	18.2	16.0	15.0	15.6	16.3	15.0	12.0	9.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	8.5	8.0	7.3	6.3	5.4	5.0	5.0	5.5	6.2	6.7	6.9	6.7	6.5	6.3	6.1	6.0	5.9	5.9	5.9	6.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	6.1	6.2	6.4	6.6	6.8	7.1	7.4	7.7	8.1	8.5	9.0	9.5	10.0	10.6	11.2	11.8	12.4	13.1	13.9	14.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	15.4	16.1	16.9	17.7	18.5	19.4	20.2	21.0	21.8	22.6	23.4	25.0	26.5	27.9	29.2	30.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.521	1.516	1.514	1.512	1.511	1.511	1.510
P	0.918	0.919	0.920	0.920	0.920	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

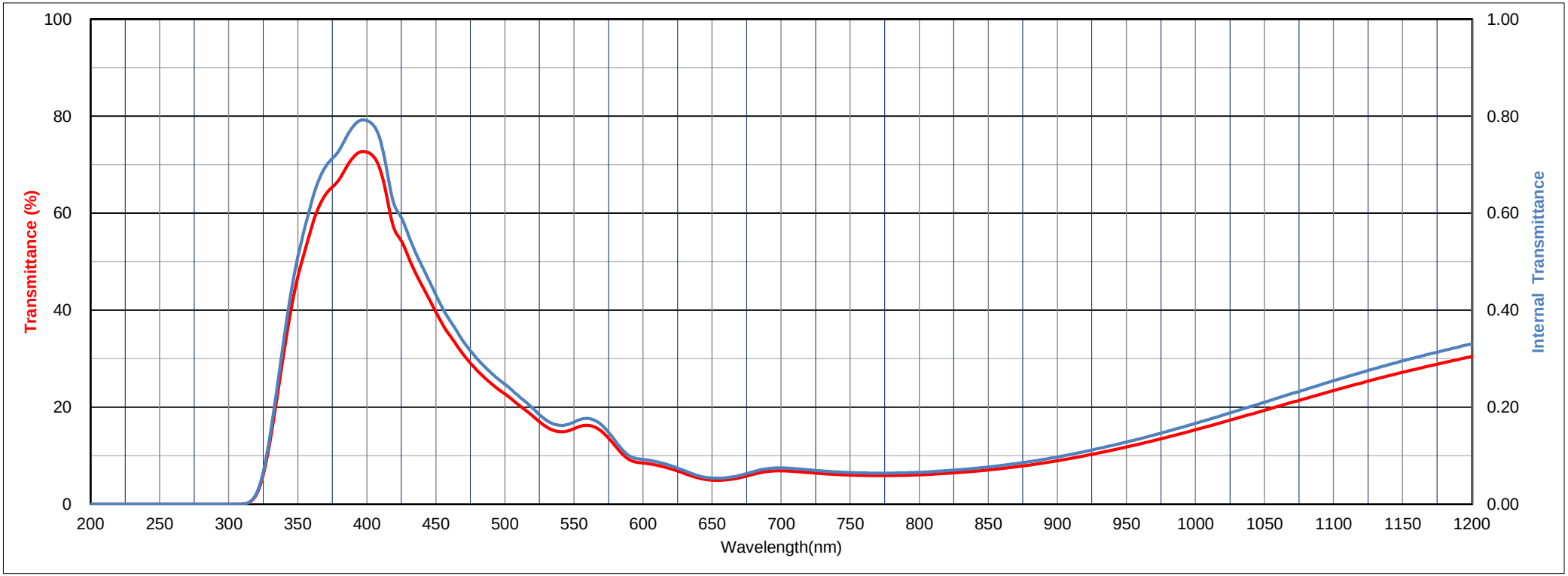
	x	y	Y	λ_d	P_e
A	0.317	0.344	13	486	34
C	0.211	0.194	15	473	51
D65	0.213	0.207	15	474	50

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	480	530	92	105	520	130	2.57

Tolerances of Transmittance(T)

B-R Conversion Value
V(mired)
-200±7



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

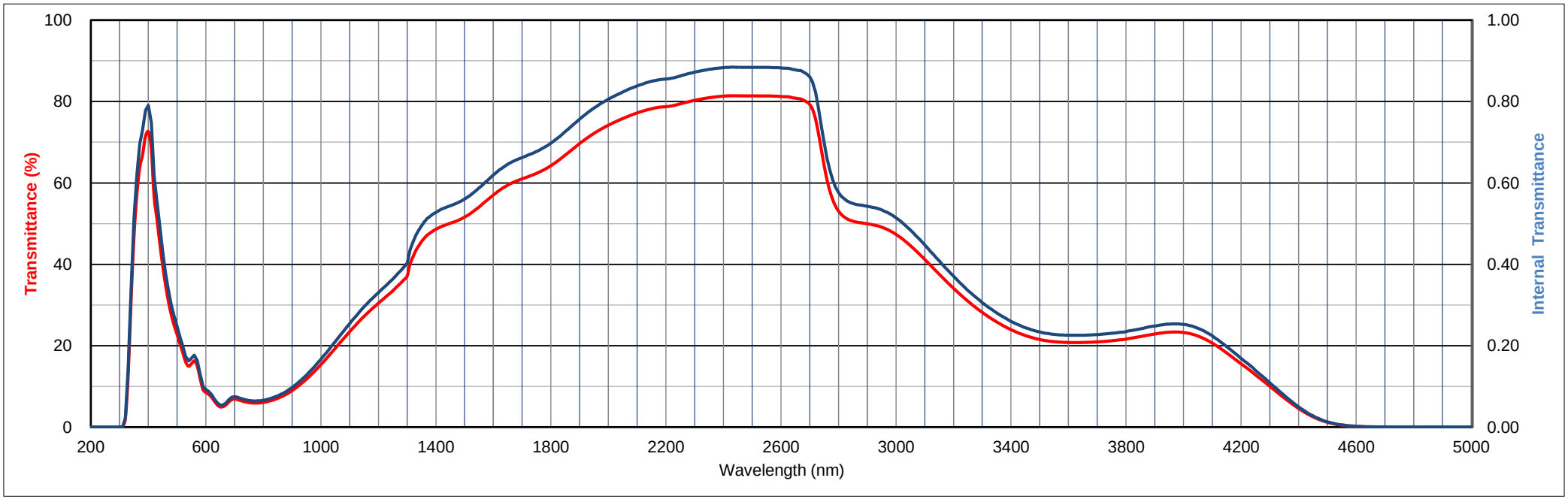
HOYA CORPORATION OPTICS SECTION

Thickness (—) mm

LB200

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	13.1	31.3	46.8	57.1	63.8	67.0	71.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	72.6	68.7	56.7	51.1	45.1	39.6	34.8	30.8	27.5	24.9	22.7	20.5	18.2	16.0	15.0	15.6	16.3	15.0	12.0	9.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	8.5	8.0	7.3	6.3	5.4	5.0	5.0	5.5	6.2	6.7	6.9	6.7	6.5	6.3	6.1	6.0	5.9	5.9	5.9	6.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	6.1	6.2	6.4	6.6	6.8	7.1	7.4	7.7	8.1	8.5	9.0	9.5	10.0	10.6	11.2	11.8	12.4	13.1	13.9	14.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	15.4	16.1	16.9	17.7	18.5	19.4	20.2	21.0	21.8	22.6	23.4	24.2	25.0	25.8	26.5	27.2	27.9	28.6	29.2	29.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	30.4	31.0	31.6	32.3	32.9	33.5	34.2	34.9	35.5	36.3	37.1	40.1	41.8	43.4	44.5	45.6	46.5	47.2	47.7	48.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	48.6	49.0	49.3	49.6	49.8	50.1	50.3	50.6	50.9	51.2	51.6	52.0	52.5	53.0	53.5	54.1	54.7	55.3	55.9	56.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	57.0	57.6	58.1	58.6	59.0	59.5	59.8	60.2	60.5	60.7	61.0	61.2	61.5	61.8	62.1	62.3	62.7	63.0	63.4	63.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	64.2	64.7	65.2	65.7	66.3	66.9	67.4	68.0	68.5	69.1	69.7	70.2	70.7	71.2	71.7	72.2	72.6	73.0	73.4	73.8
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	74.2	75.8	77.2	78.2	78.7	79.4	80.3	80.9	81.3	81.4	81.4	81.4	81.2	80.8	79.3	64.3	53.1	50.6	50.0	49.1
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	47.3	44.6	41.2	37.6	34.1	31.0	28.2	25.8	23.9	22.5	21.5	21.0	20.8	20.8	20.9	21.2	21.6	22.3	22.9	23.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	23.2	22.4	20.6	18.2	15.6	12.8	10.0	7.2	4.6	2.5	1.2	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

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Near-Infrared Absorbing Filters (Color Compensating Filters)

These filters selectively absorb in the red and near-infrared wavelength regions. This filter type is used to correct imaging sensitivity and exposure meter sensitivity.

Near-infrared absorbing filters feature near-infrared absorbing function, high transmittance in the visible region and high resistivity to weathering at the same time.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

C500S

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.31	4.34	17.77	37.01	54.21	66.33	73.84	78.32	81.00
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	82.72	84.03	84.85	85.63	86.19	86.77	87.25	87.67	88.00	88.29	88.44	88.39	88.10	87.44	86.28	84.40	81.70	77.98	73.29	67.71
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	61.39	54.59	47.65	40.97	34.66	28.83	23.60	19.34	15.55	12.44	9.93	7.91	6.34	5.12	4.16	3.43	2.86	2.42	2.08	1.81
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.61	1.44	1.33	1.22	1.15	1.09	1.04	1.00	0.99	0.97	0.98	0.99	1.01	1.04	1.09	1.14	1.19	1.28	1.37	1.47
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	1.59	1.73	1.88	2.05	2.24	2.45	2.68	2.92	3.19	3.47	3.79	4.48	5.27	6.13	7.09	8.14				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.528	1.519	1.514	1.511	1.509	1.508	1.507
P	0.916	0.919	0.920	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
0

Color Specification

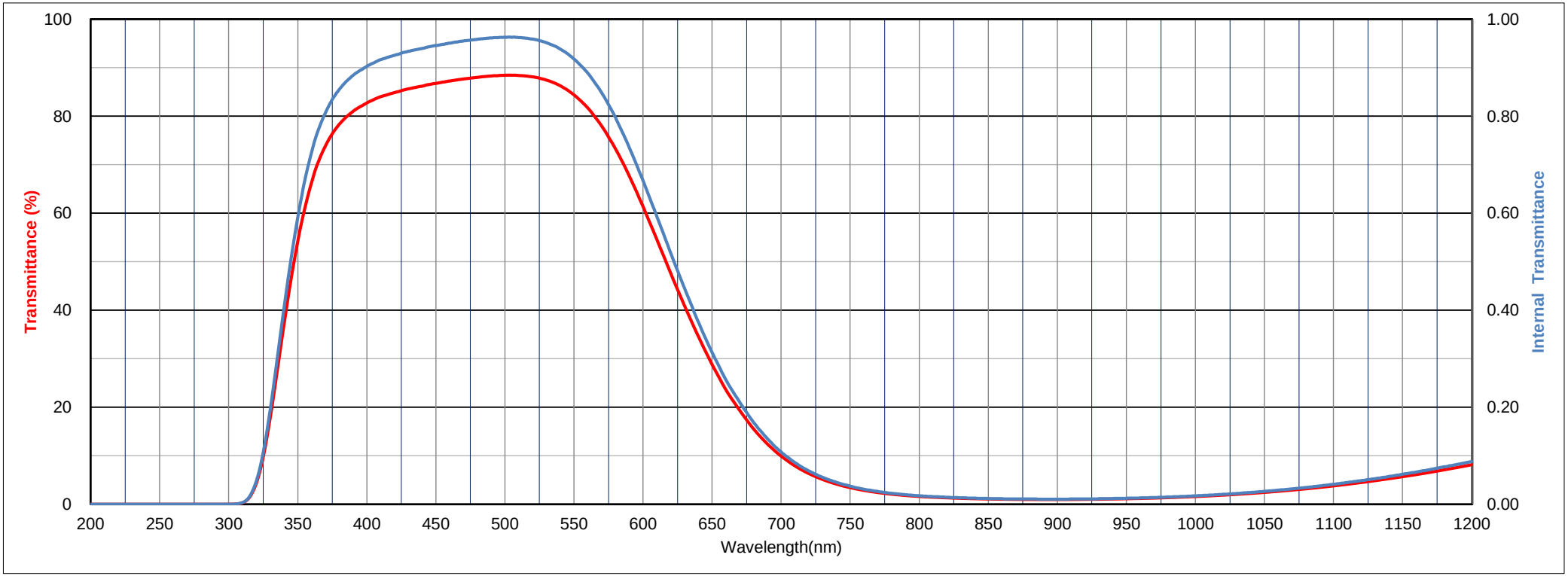
	x	y	Y	λ_d	P_e
A	0.389	0.426	71	500	13
C	0.269	0.312	76	490	16
D65	0.271	0.326	77	491	15

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	615	675	54	70	485	120	2.54

Tolerance of Transmittance (T)

Transmittance at 400nm	Transmittance at 500nm	Transmittance at 600nm
T400(%)	T500(%)	T600(%)
≧80	≧88	≧58



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

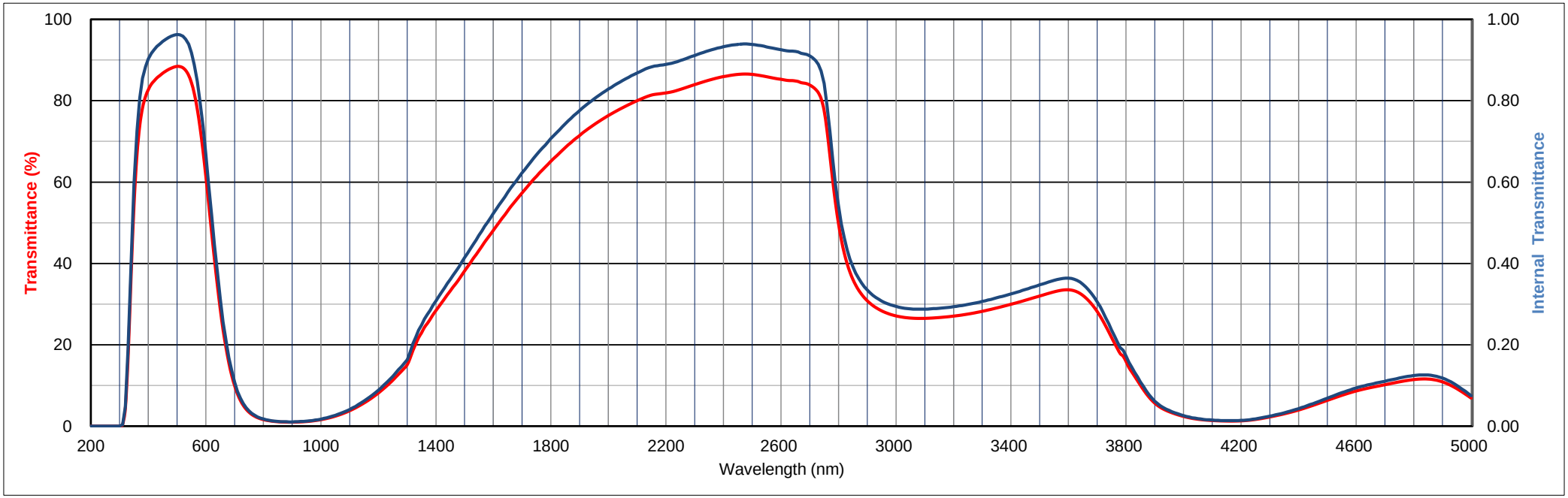
HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

C500S

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	0.00	0.31	4.34	17.77	37.01	54.21	66.33	73.84	78.32	81.00
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	82.72	84.03	84.85	85.63	86.19	86.77	87.25	87.67	88.00	88.29	88.44	88.39	88.10	87.44	86.28	84.40	81.70	77.98	73.29	67.71
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	61.39	54.59	47.65	40.97	34.66	28.83	23.60	19.34	15.55	12.44	9.93	7.91	6.34	5.12	4.16	3.43	2.86	2.42	2.08	1.81
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.61	1.44	1.33	1.22	1.15	1.09	1.04	1.00	0.99	0.97	0.98	0.99	1.01	1.04	1.09	1.14	1.19	1.28	1.37	1.47
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	1.59	1.73	1.88	2.05	2.24	2.45	2.68	2.92	3.19	3.47	3.79	4.13	4.48	4.86	5.27	5.69	6.13	6.59	7.09	7.61
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	8.14	8.73	9.33	9.95	10.60	11.28	12.02	12.76	13.48	14.25	15.05	16.65	18.59	20.19	21.77	22.93	24.27	25.23	26.26	27.41
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	28.40	29.38	30.34	31.32	32.32	33.25	34.23	35.10	36.08	37.13	38.18	39.17	40.17	41.25	42.18	43.20	44.23	45.29	46.24	47.19
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	48.16	49.15	50.11	51.08	51.96	52.96	53.92	54.78	55.65	56.50	57.37	58.20	59.04	59.88	60.70	61.43	62.24	62.95	63.67	64.39
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	65.13	65.82	66.46	67.14	67.83	68.49	69.14	69.72	70.36	70.91	71.45	72.08	72.60	73.13	73.62	74.11	74.59	75.05	75.50	75.93
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	76.37	78.30	80.02	81.39	81.92	82.79	83.96	85.06	85.94	86.47	86.47	85.91	85.27	84.86	83.87	77.63	49.85	36.10	30.83	28.35
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	27.10	26.57	26.50	26.70	27.05	27.55	28.23	29.05	29.96	30.95	32.00	33.02	33.52	32.13	28.15	21.76	15.91	10.06	5.65	3.55
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	2.39	1.70	1.38	1.25	1.30	1.65	2.26	3.02	3.96	5.10	6.34	7.56	8.64	9.47	10.18	10.88	11.44	11.57	10.90	9.23
λnm	5000																			
T	6.90																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

C5000

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	0.00	0.01	0.20	5.37	25.50	50.41	67.52	76.89	81.67	84.09	85.48
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	86.39	87.09	87.63	88.09	88.48	88.82	89.16	89.36	89.56	89.65	89.67	89.54	89.13	88.42	87.21	85.35	82.67	79.14	74.61	69.19
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	62.93	56.14	49.00	42.01	35.27	29.06	23.45	18.92	14.92	11.74	9.19	7.21	5.70	4.56	3.68	3.02	2.53	2.16	1.88	1.68
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.54	1.44	1.38	1.34	1.33	1.34	1.38	1.43	1.50	1.60	1.71	1.85	2.01	2.19	2.39	2.61	2.86	3.13	3.44	3.76
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	4.13	4.52	4.95	5.41	5.90	6.43	6.99	7.60	8.22	8.89	9.62	11.18	12.92	14.77	16.81	18.98				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.525	1.518	1.514	1.511	1.509	1.509	1.508
P	0.917	0.919	0.920	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
0

Color Specification

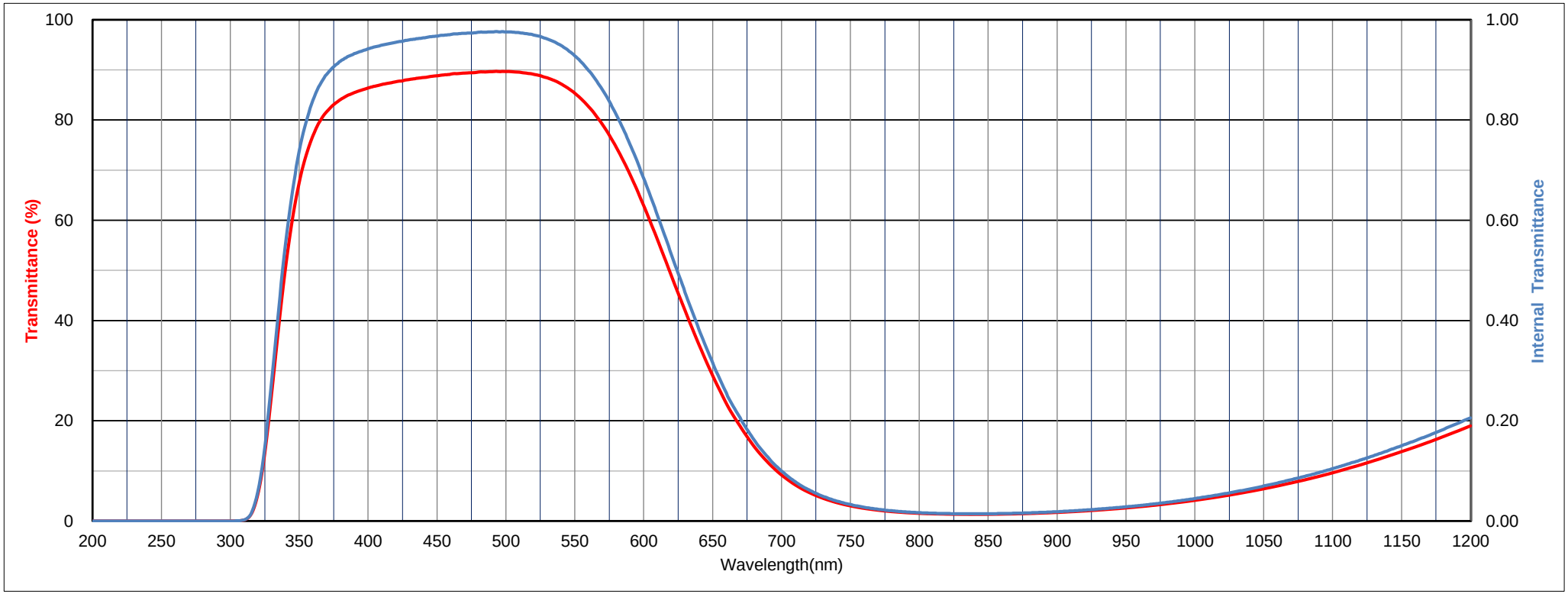
	x	y	Y	λ_d	P_e
A	0.390	0.425	72	500	13
C	0.269	0.310	77	489	16
D65	0.272	0.325	78	490	15

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	4	370	405	127	158	380	520	3.40

Tolerance of Transmittance (T)

Transmittance at 400nm	Transmittance at 500nm	Transmittance at 600nm
T400(%)	T500(%)	T600(%)
≧86	≧89	≧60



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HOYA

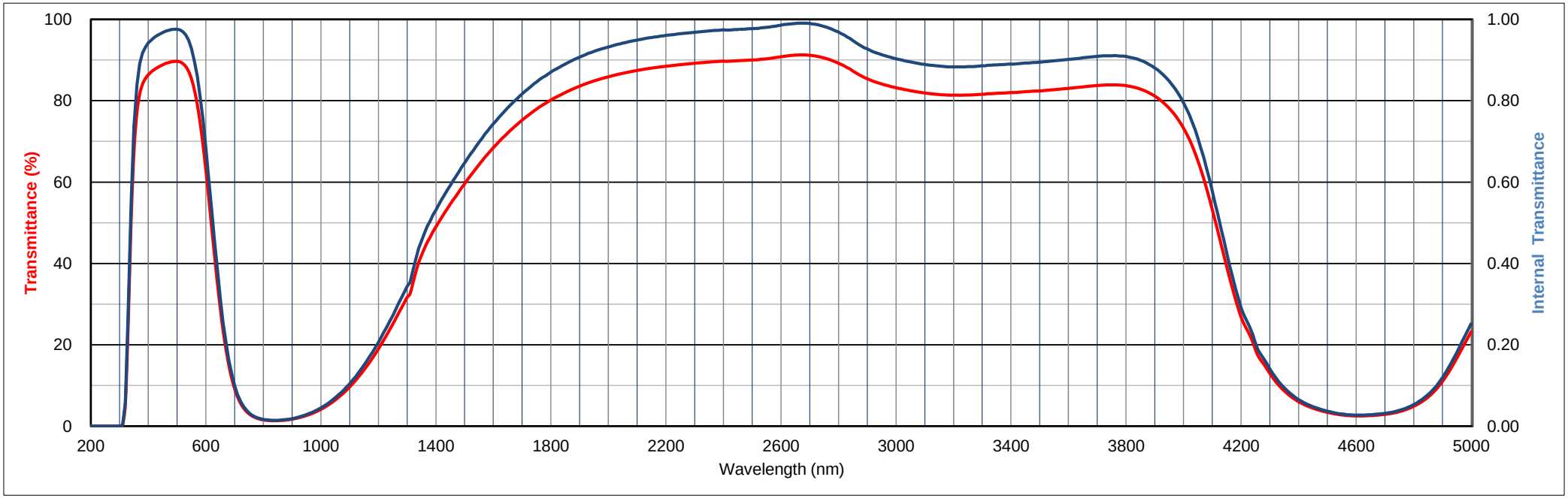
HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

C5000

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	0.00	0.01	0.20	5.37	25.50	50.41	67.52	76.89	81.67	84.09	85.48
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	86.39	87.09	87.63	88.09	88.48	88.82	89.16	89.36	89.56	89.65	89.67	89.54	89.13	88.42	87.21	85.35	82.67	79.14	74.61	69.19
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	62.93	56.14	49.00	42.01	35.27	29.06	23.45	18.92	14.92	11.74	9.19	7.21	5.70	4.56	3.68	3.02	2.53	2.16	1.88	1.68
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.54	1.44	1.38	1.34	1.33	1.34	1.38	1.43	1.50	1.60	1.71	1.85	2.01	2.19	2.39	2.61	2.86	3.13	3.44	3.76
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	4.13	4.52	4.95	5.41	5.90	6.43	6.99	7.60	8.22	8.89	9.62	10.40	11.18	12.04	12.92	13.84	14.77	15.76	16.81	17.87
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	18.98	20.16	21.34	22.55	23.83	25.07	26.40	27.75	29.04	30.35	31.68	32.51	35.16	37.83	40.20	42.02	43.67	45.20	46.46	47.84
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	48.99	50.16	51.29	52.44	53.49	54.58	55.62	56.57	57.62	58.67	59.57	60.61	61.55	62.47	63.38	64.29	65.17	66.07	66.88	67.68
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	68.47	69.22	69.99	70.73	71.37	72.08	72.78	73.40	74.02	74.65	75.23	75.82	76.35	76.91	77.45	77.93	78.45	78.89	79.32	79.76
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	80.20	80.59	80.95	81.30	81.66	82.02	82.36	82.68	83.00	83.29	83.58	83.88	84.13	84.40	84.64	84.88	85.09	85.31	85.51	85.70
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	85.89	86.74	87.46	88.02	88.47	88.86	89.21	89.50	89.74	89.84	90.00	90.31	90.81	91.21	91.17	90.51	89.22	87.30	85.40	84.13
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	83.19	82.47	81.90	81.53	81.37	81.40	81.58	81.82	82.00	82.23	82.41	82.72	83.04	83.40	83.74	83.90	83.71	82.85	81.13	78.14
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	73.25	65.20	53.24	39.27	26.82	18.81	12.98	8.70	6.01	4.42	3.40	2.76	2.50	2.59	2.89	3.55	4.86	7.12	10.94	16.66
λnm	5000																			
T	23.17																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 0.45 mm

CD700

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	2E-06	5E-05	2E-03	6E-02	1.97	15.29	39.20	59.72	71.92	78.24	81.45	83.27
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.42	85.31	85.95	86.53	87.11	87.56	87.96	88.24	88.49	88.67	88.75	88.58	88.13	87.26	85.86	83.75	80.78	76.87	72.03	66.29
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	59.82	52.96	45.83	38.92	32.32	26.27	20.92	16.66	12.90	9.92	7.61	5.84	4.50	3.49	2.74	2.18	1.78	1.47	1.24	1.08
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.96	0.87	0.83	0.79	0.77	0.76	0.79	0.80	0.85	0.88	0.96	1.02	1.12	1.20	1.35	1.45	1.61	1.78	1.95	2.16
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	2.38	2.63	2.89	3.19	3.50	3.85	4.22	4.62	5.03	5.49	5.98	7.06	8.30	9.65	11.20	12.90				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.554	1.544	1.539	1.535	1.533	1.532	1.532
P	0.910	0.913	0.914	0.915	0.915	0.915	0.916

Classes of Bubbles and Inclusions

Bubble Class
0

Color Specification

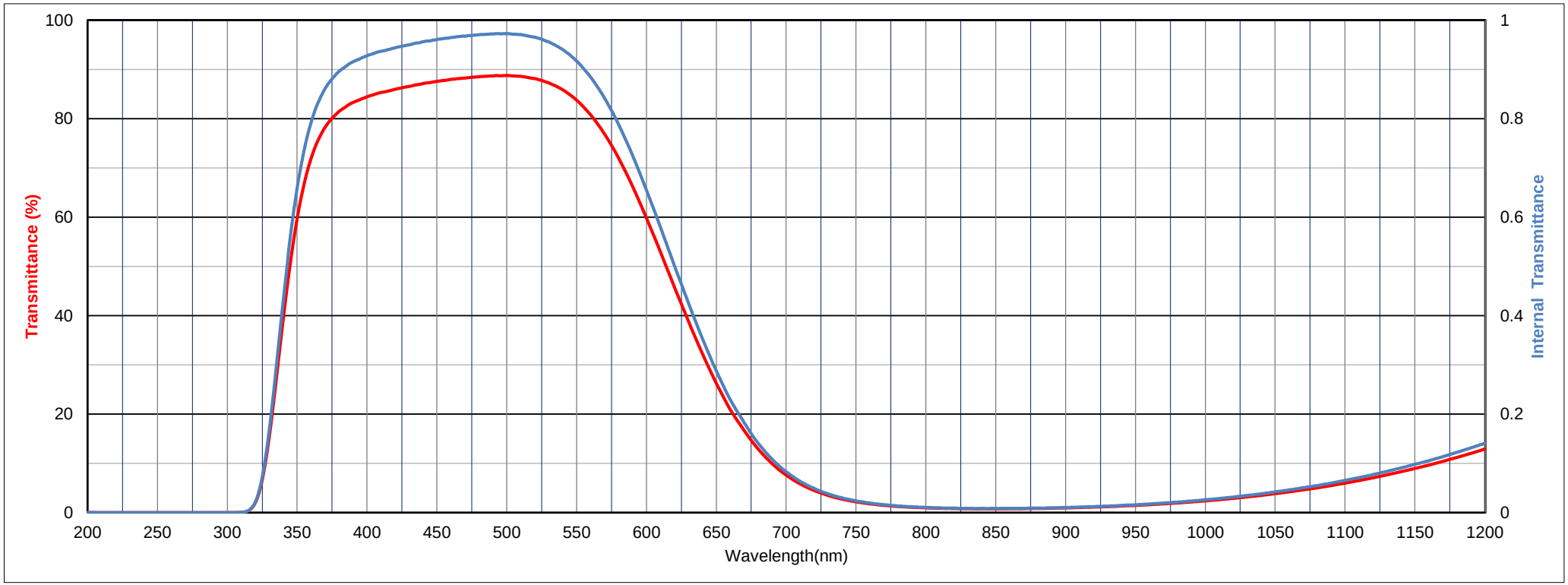
	x	y	Y	λ_d	P_e
A	0.385	0.426	70	500	14
C	0.266	0.310	76	489	17
D65	0.268	0.324	76	490	17

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	4	425	471	117	141	370	490	3.08

Tolerance of Transmittance (T)

Transmittance at 400nm	Transmittance at 500nm	Transmittance at 600nm
T400(%)	T500(%)	T600(%)
≧83	≧87	≧57



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HOYA

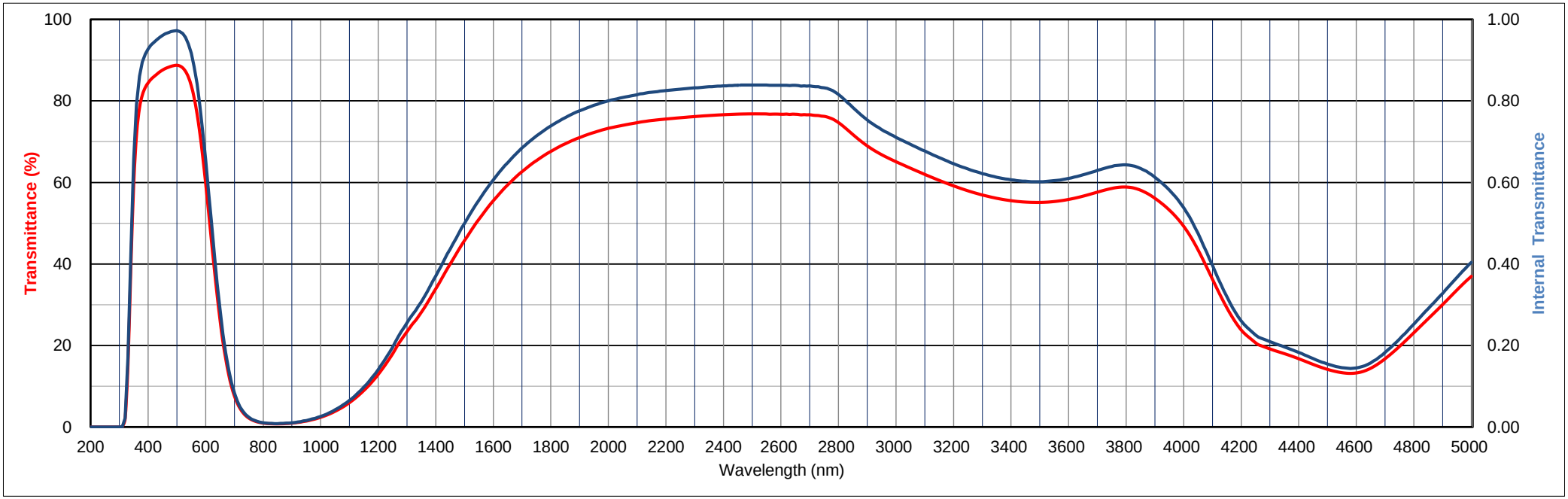
HOYA CORPORATION OPTICS SECTION

Thickness 0.45 mm

CD700

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	2E-06	5E-05	2E-03	6E-02	1.97	15.29	39.20	59.72	71.92	78.24	81.45	83.27
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.42	85.31	85.95	86.53	87.11	87.56	87.96	88.24	88.49	88.67	88.75	88.58	88.13	87.26	85.86	83.75	80.78	76.87	72.03	66.29
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	59.82	52.96	45.83	38.92	32.32	26.27	20.92	16.66	12.90	9.92	7.61	5.84	4.50	3.49	2.74	2.18	1.78	1.47	1.24	1.08
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.96	0.87	0.83	0.79	0.77	0.76	0.79	0.80	0.85	0.88	0.96	1.02	1.12	1.20	1.35	1.45	1.61	1.78	1.95	2.16
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	2.38	2.63	2.89	3.19	3.50	3.85	4.22	4.62	5.03	5.49	5.98	6.51	7.06	7.66	8.30	8.96	9.65	10.40	11.20	12.02
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	12.90	13.84	14.80	15.82	16.87	17.94	19.15	20.36	21.39	22.40	23.40	24.39	25.36	26.16	27.14	28.17	29.21	30.36	31.53	32.75
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	33.91	35.08	36.33	37.58	38.82	39.99	41.13	42.34	43.52	44.67	45.75	46.80	47.90	48.96	50.00	50.96	51.89	52.85	53.78	54.68
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	55.51	56.31	57.13	57.93	58.70	59.39	60.08	60.77	61.44	62.08	62.66	63.22	63.81	64.36	64.89	65.35	65.85	66.32	66.78	67.23
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	67.60	68.01	68.41	68.79	69.16	69.48	69.81	70.14	70.45	70.75	71.01	71.28	71.55	71.80	72.04	72.25	72.48	72.70	72.91	73.10
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	73.28	74.01	74.66	75.20	75.56	75.88	76.17	76.41	76.62	76.76	76.82	76.81	76.74	76.74	76.61	76.22	74.68	71.76	68.97	66.81
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	65.08	63.51	61.97	60.51	59.16	57.95	56.93	56.11	55.52	55.19	55.10	55.32	55.83	56.63	57.62	58.53	58.87	58.10	56.11	53.23
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	49.24	43.45	36.26	29.26	23.80	20.66	19.15	17.99	16.75	15.36	14.14	13.33	13.26	14.41	16.74	19.75	23.12	26.57	30.03	33.61
λnm	5000																			
T	36.96																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

CM700

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	3.43E-03	0.79	10.68	34.15	56.71	70.74	77.85	81.44	83.47
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.75	85.46	86.16	86.65	87.33	87.73	88.10	88.21	88.58	88.71	88.70	88.35	87.57	86.28	84.25	81.19	77.10	71.83	65.55	58.33
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	50.55	42.72	34.99	27.93	21.64	16.33	11.98	8.78	6.21	4.35	3.06	2.14	1.52	1.08	0.78	0.58	0.44	0.35	0.28	0.24
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.20	0.18	0.17	0.16	0.15	0.15	0.16	0.16	0.18	0.19	0.21	0.23	0.26	0.30	0.33	0.38	0.43	0.49	0.56	0.64
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.73	0.83	0.94	1.07	1.22	1.38	1.56	1.76	1.97	2.21	2.49	3.11	3.84	4.70	5.73	6.93				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.554	1.544	1.539	1.536	1.534	1.533	1.532
P	0.910	0.913	0.914	0.915	0.915	0.915	0.915

Classes of Bubbles and Inclusions

Bubble Class
0

Color Specification

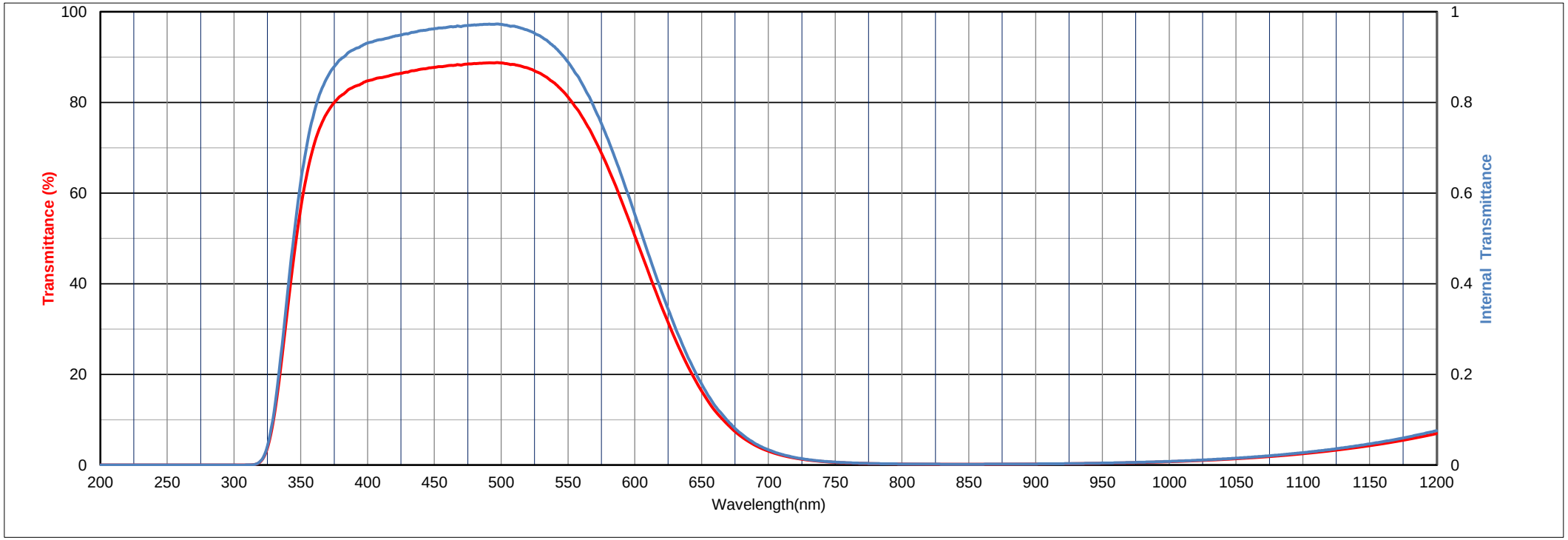
	x	y	Y	λ_d	P_e
A	0.364	0.429	65	499	19
C	0.252	0.305	71	489	22
D65	0.254	0.320	72	490	22

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	4	429	474	118	141	375	490	3.07

Tolerance of Transmittance (T)

Transmittance at 400nm	Transmittance at 500nm	Transmittance at 700nm
T400(%)	T500(%)	T700(%)
≧82	≧86	≦6



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HOYA

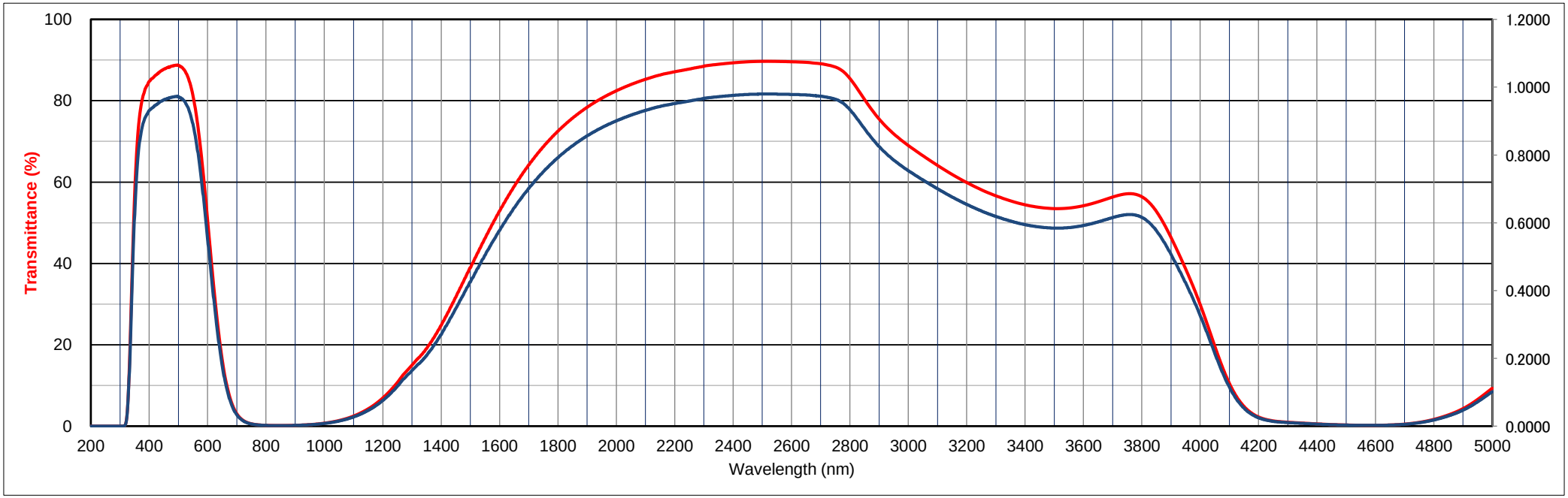
HOYA CORPORATION OPTICS SECTION

Thickness 1.00 mm

CM700

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	3.4E-03	0.79	10.68	34.15	56.71	70.74	77.85	81.44	83.47
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.75	85.46	86.16	86.65	87.33	87.73	88.10	88.21	88.58	88.71	88.70	88.35	87.57	86.28	84.25	81.19	77.10	71.83	65.55	58.33
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	50.55	42.72	34.99	27.93	21.64	16.33	11.98	8.78	6.21	4.35	3.06	2.14	1.52	1.08	0.78	0.58	0.44	0.35	0.28	0.24
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.20	0.18	0.17	0.16	0.15	0.15	0.16	0.16	0.18	0.19	0.21	0.23	0.26	0.30	0.33	0.38	0.43	0.49	0.56	0.64
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.73	0.83	0.94	1.07	1.22	1.38	1.56	1.76	1.97	2.21	2.49	2.78	3.11	3.46	3.84	4.26	4.70	5.19	5.73	6.30
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	6.93	7.59	8.31	9.08	9.87	10.73	11.70	12.65	13.41	14.19	15.00	15.82	16.57	17.34	18.20	19.06	20.09	21.20	22.36	23.61
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	24.76	26.09	27.49	28.91	30.35	31.67	33.16	34.66	36.16	37.67	38.94	40.35	41.85	43.32	44.79	46.16	47.52	48.90	50.30	51.62
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	52.89	54.12	55.38	56.61	57.83	58.93	60.02	61.12	62.21	63.25	64.21	65.14	66.09	67.01	67.90	68.68	69.52	70.31	71.09	71.82
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	72.48	73.18	73.87	74.53	75.15	75.70	76.29	76.85	77.40	77.93	78.37	78.87	79.33	79.79	80.21	80.58	81.01	81.37	81.77	82.08
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	82.45	83.98	85.27	86.32	87.12	87.80	88.45	88.97	89.32	89.57	89.68	89.66	89.58	89.44	89.10	88.29	85.47	80.34	75.51	71.87
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	68.99	66.49	64.11	61.89	59.90	58.12	56.62	55.39	54.41	53.78	53.48	53.61	54.18	55.15	56.32	57.12	56.39	52.78	46.39	38.68
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	29.88	19.68	10.52	4.86	2.26	1.29	0.96	0.75	0.55	0.39	0.28	0.22	0.21	0.29	0.50	0.92	1.66	2.76	4.31	6.55
λnm	5000																			
T	9.30																			



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Neutral Density Filters

Neutral density filters feature almost even spectral transmittance in the visible region, and are classified by the average transmittance within the wavelengths from 400 nm through 700 nm. For example, ND50 indicates that the average transmittance is 50%.

Neutral density filters can be used for various purposes including adjustment of light amount because the light intensity can be controlled without selectively absorbing light with a specific wavelength.

The relationships between general name in the product market/what we call and darkening performance are shown as follows:

Amount of	Transmittance	OD value	Our filter name	General name
1/2	50.0	0.3	ND50	ND2
1/4	25.0	0.6	ND25	ND4
1/8	12.5	0.9	ND13	ND8
1/16	6.3	1.2	Made-to-order products	ND16
1/32	3.1	1.5	ND3	ND32
1/64	1.6	1.8	Made-to-order products	ND64
1/100 (1/128)	1.0 0.8	2.0 2.1	ND1	ND100
1/200 (1/256)	0.5 0.4	2.3 2.4	ND0.3	ND200
1/500 (1/512)	0.3 0.2	2.6 2.7		ND500
1/1000 (1/1024)	0.1 0.1	2.9 3.0	ND0.1	ND1000

Note: In the product market, 1/2 may be called ND2 according to the darkening characteristics of the light amount. We call our product with 50% of transmittance level ND50.

This product can achieve high transmittance by changing the thickness if the transmittance characteristics are regarded as important.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.50) mm

ND0

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.592	1.568	1.555	1.548	1.544	1.541	1.539
P	0.901	0.907	0.910	0.912	0.913	0.913	0.914

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

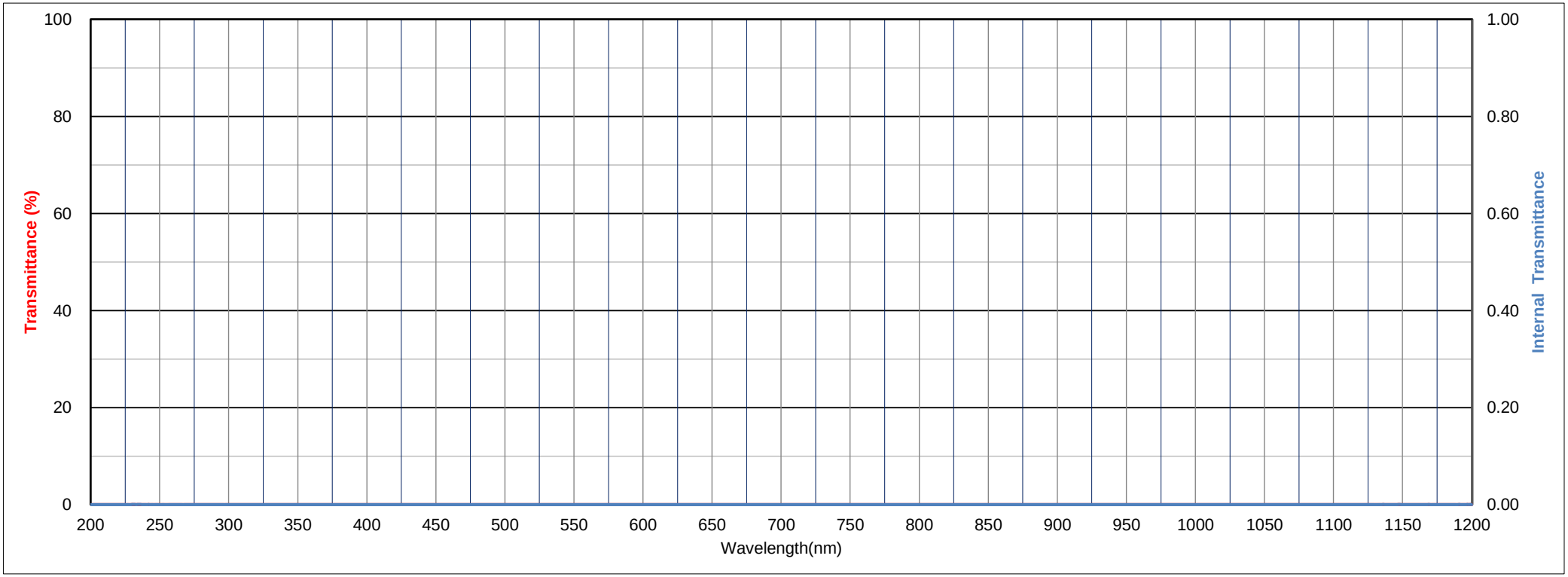
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	1	542	622	-	76	-	-	2.47

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
<0.01	>4



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HOYA

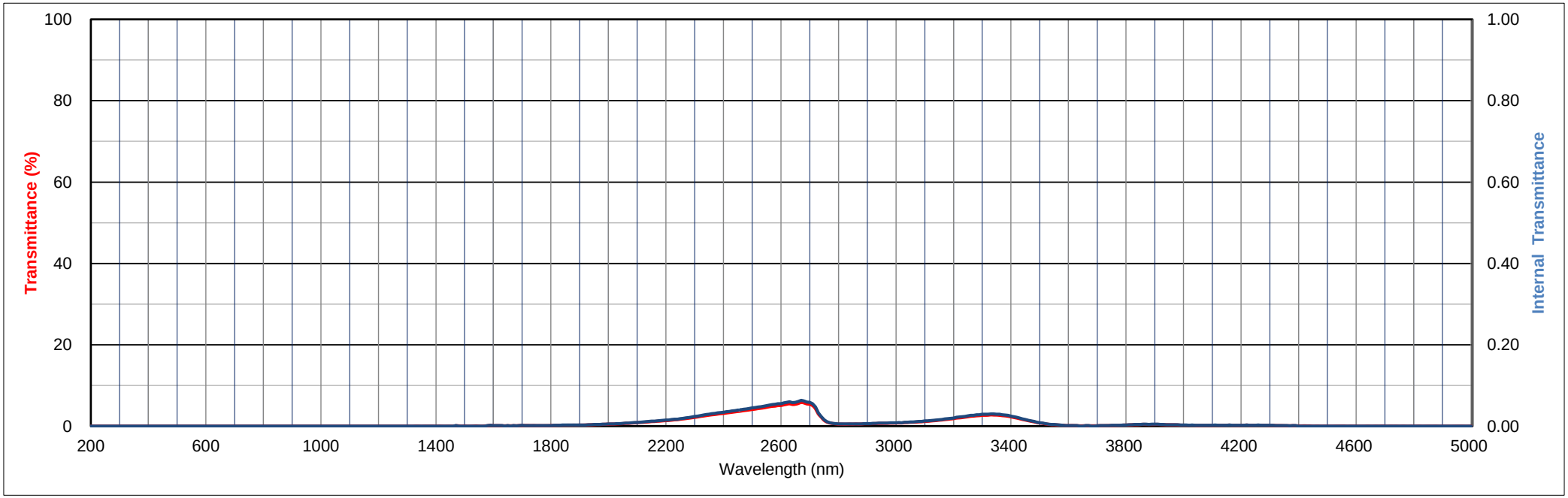
HOYA CORPORATION OPTICS SECTION

Thickness (2.50) mm

ND0

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.001	<1E-05	0.001	0.001	0.001	0.001
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	<1E-05	0.001	0.001	<1E-05	0.001	<1E-05	<1E-05	0.001	0.001	<1E-05	0.001	<1E-05	0.001	0.001	0.001	0.001	<1E-05	0.001	0.001	0.002
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.004	0.004	0.005	0.005
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.005	0.007	0.009	0.012	0.015	0.019	0.024	0.029	0.034	0.039	0.045	0.051	0.055	0.059	0.059	0.016	0.005	0.005	0.006	0.007
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.008	0.010	0.013	0.016	0.020	0.025	0.029	0.030	0.025	0.016	0.008	0.004	0.002	0.001	0.001	0.002	0.003	0.004	0.005	0.004
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	<1E-05	0.001	0.001	0.001	0.001	<1E-05	<1E-05	0.001	<1E-05	0.001
λnm	5000																			
τ	0.001																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (3.1) mm

ND0.1

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	0.001	<1E-05	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.004	0.006	0.009	0.011	0.012	0.014	0.015	0.017	0.018	0.019	0.020
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.021	0.021	0.022	0.022	0.022	0.023	0.023	0.023	0.024	0.022	0.023	0.024	0.022	0.023	0.022	0.022	0.021	0.021	0.020	0.021
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.020	0.020	0.020	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.021	0.022	0.023	0.024	0.026				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.534	1.520	1.513	1.509	1.506	1.504	1.503
P	0.915	0.918	0.920	0.921	0.922	0.922	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

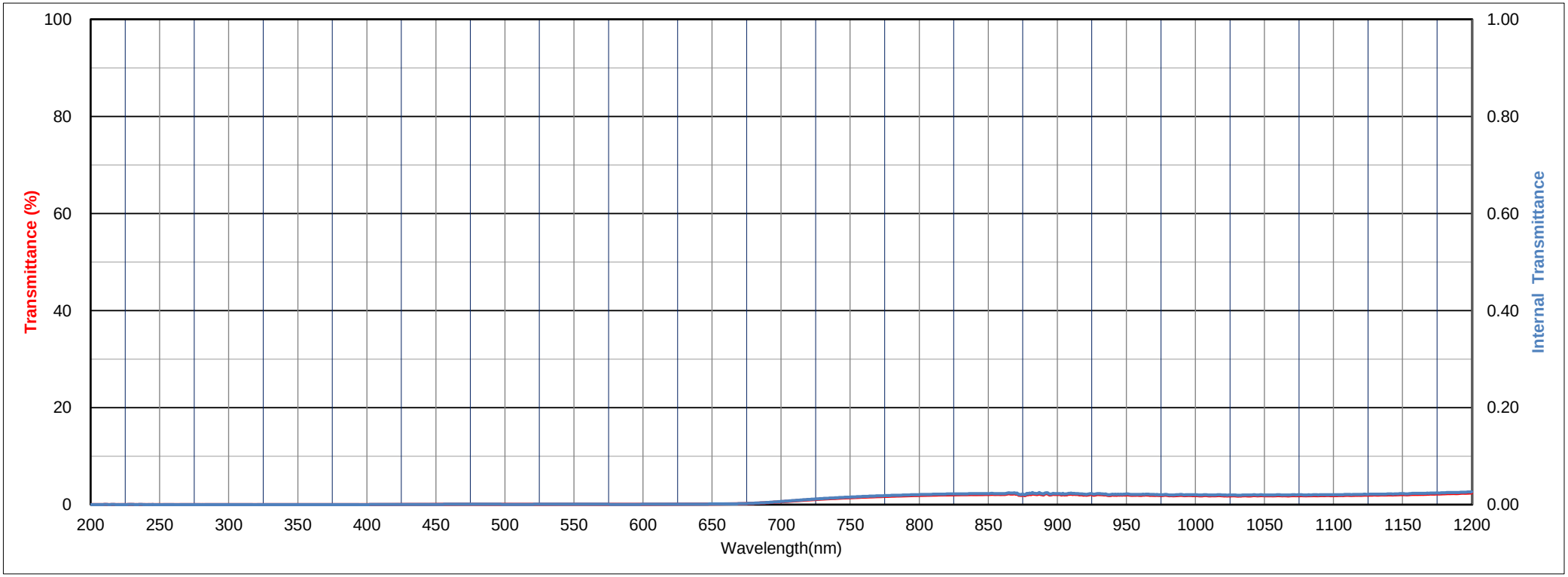
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
0.1±0.05	3 ±0.3



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HOYA

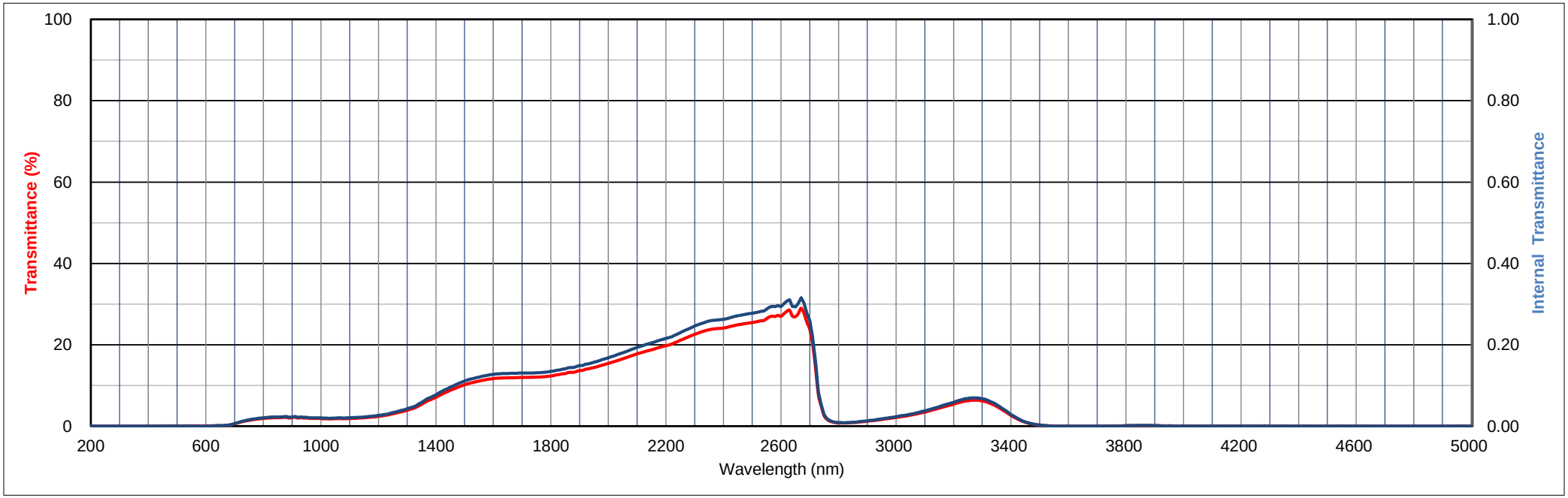
HOYA CORPORATION OPTICS SECTION

Thickness (3.13) mm

ND0.1

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	0.001	<1E-05	0.001	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	<1E-05	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.003	0.004	0.006	0.009	0.011	0.012	0.014	0.015	0.017	0.018	0.019	0.020
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.021	0.021	0.022	0.022	0.022	0.023	0.023	0.023	0.024	0.022	0.023	0.024	0.022	0.023	0.022	0.022	0.021	0.021	0.020	0.021
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.020	0.020	0.020	0.019	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.021	0.021	0.022	0.022	0.022	0.023	0.024	0.024	0.025
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.026	0.027	0.029	0.030	0.031	0.033	0.035	0.037	0.039	0.040	0.043	0.045	0.047	0.050	0.054	0.058	0.063	0.067	0.070	0.074
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.077	0.081	0.085	0.089	0.092	0.096	0.099	0.102	0.105	0.108	0.111	0.113	0.116	0.117	0.119	0.121	0.122	0.124	0.125	0.126
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.127	0.128	0.129	0.129	0.129	0.129	0.130	0.130	0.130	0.130	0.130	0.131	0.131	0.131	0.131	0.131	0.131	0.132	0.133	0.133
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.134	0.136	0.138	0.138	0.140	0.141	0.144	0.144	0.144	0.147	0.149	0.149	0.152	0.153	0.155	0.157	0.159	0.161	0.164	0.166
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.168	0.180	0.194	0.204	0.215	0.230	0.246	0.258	0.263	0.272	0.277	0.288	0.294	0.293	0.260	0.028	0.009	0.010	0.013	0.018
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.023	0.029	0.037	0.048	0.059	0.068	0.067	0.053	0.029	0.010	0.003	0.001	0.001	0.001	<1E-05	0.001	0.001	0.002	0.001	0.001
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.001	<1E-05	0.001	0.001	0.001	0.001	0.001	0.001	<1E-05	<1E-05	0.001	0.001	<1E-05	<1E-05	<1E-05	0.001	0.001	<1E-05	<1E-05	0.001
λnm	5000																			
τ	0.001																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.85) mm

ND0.3

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.05	0.08	0.11	0.14	0.14	0.19	0.25	0.26	0.24	0.21	0.20	0.20	0.20	0.22	0.23	0.24	0.23	0.20	0.18	0.18
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.19	0.22	0.25	0.27	0.29	0.32	0.37	0.46	0.64	0.94	1.30	1.69	2.04	2.33	2.57	2.77	2.94	3.09	3.21	3.31
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	3.40	3.48	3.54	3.58	3.61	3.62	3.62	3.60	3.58	3.54	3.50	3.46	3.41	3.35	3.31	3.26	3.21	3.17	3.13	3.09
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	3.06	3.02	3.00	2.98	2.96	2.95	2.94	2.95	2.95	2.96	2.98	3.03	3.12	3.24	3.40	3.60				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.531	1.520	1.514	1.511	1.508	1.507	1.506
P	0.916	0.918	0.920	0.921	0.921	0.921	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

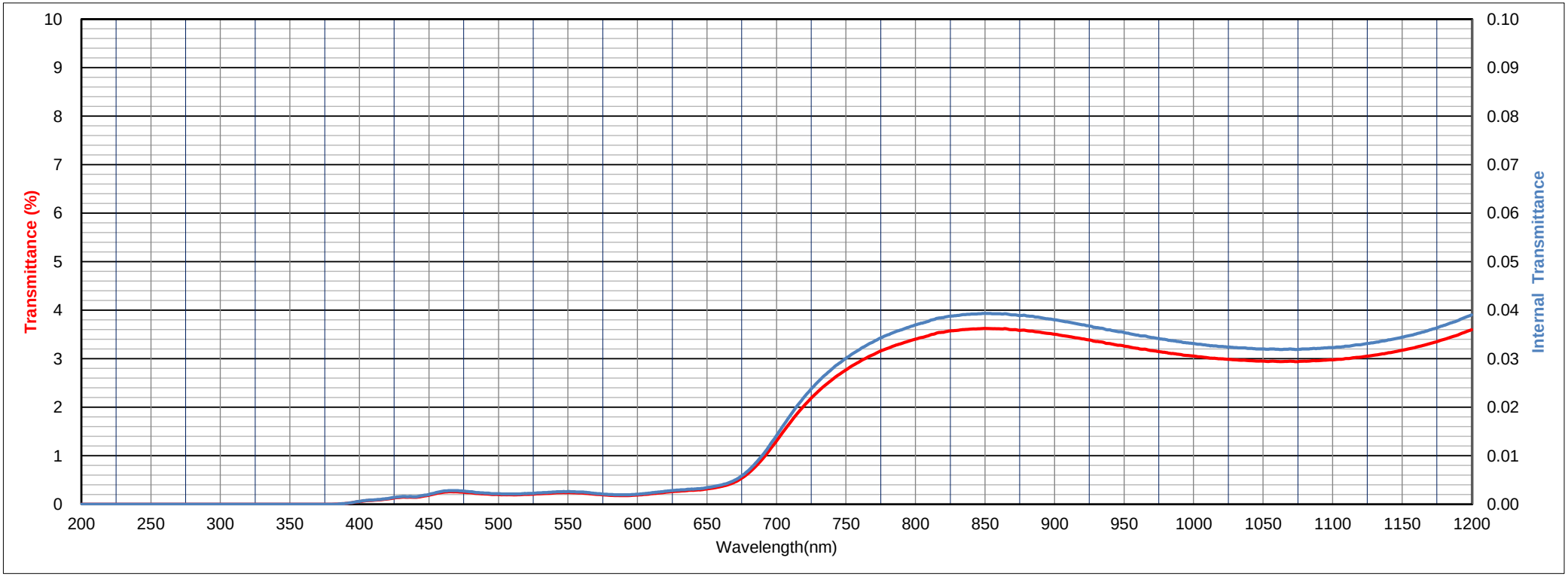
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
0.3±0.05	2.5±0.1



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HOYA

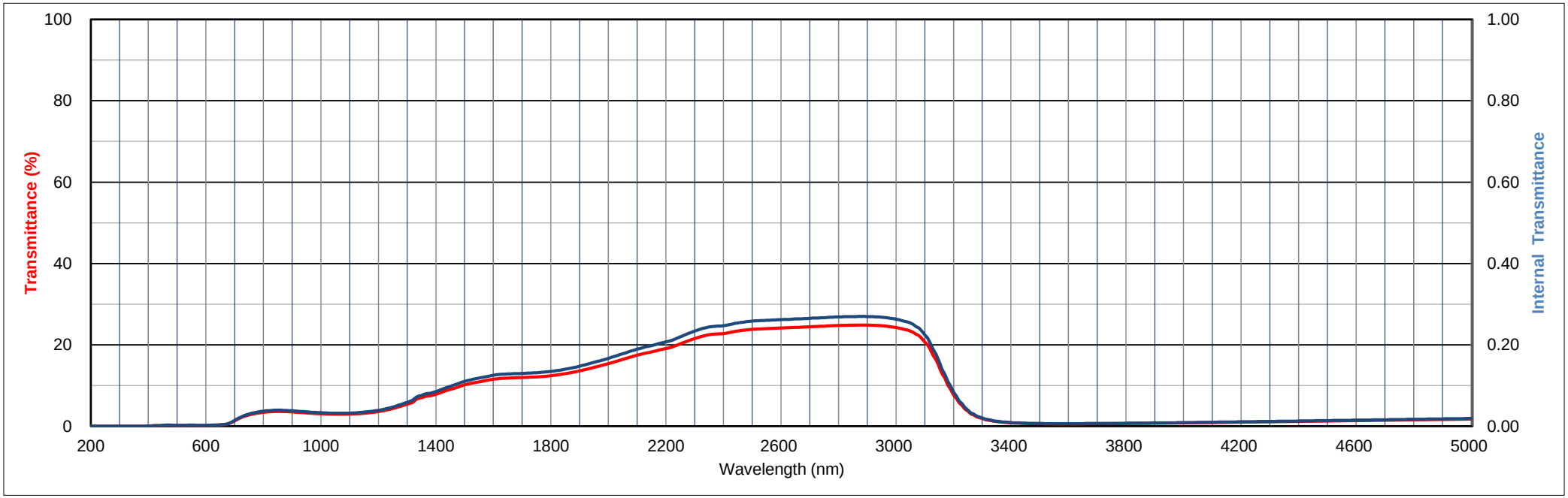
HOYA CORPORATION OPTICS SECTION

Thickness (2.85) mm

ND0.3

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.9	1.3	1.7	2.0	2.3	2.6	2.8	2.9	3.1	3.2	3.3
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	3.4	3.5	3.5	3.6	3.6	3.6	3.6	3.6	3.6	3.5	3.5	3.5	3.4	3.4	3.3	3.3	3.2	3.2	3.1	3.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	3.1	3.0	3.0	3.0	3.0	3.0	2.9	2.9	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.2	3.2	3.3	3.4	3.5
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	3.6	3.7	3.9	4.0	4.2	4.3	4.5	4.7	4.9	5.2	5.4	5.6	5.9	6.5	6.9	7.0	7.3	7.4	7.5	7.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	7.8	8.1	8.3	8.6	8.9	9.0	9.3	9.5	9.7	9.9	10.2	10.3	10.5	10.6	10.8	10.9	11.0	11.2	11.3	11.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	11.5	11.6	11.7	11.8	11.8	11.8	11.9	11.9	11.9	11.9	12.0	12.0	12.0	12.1	12.1	12.1	12.2	12.2	12.3	12.3
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	12.4	12.5	12.6	12.7	12.8	12.9	13.0	13.2	13.3	13.4	13.6	13.8	13.9	14.1	14.3	14.5	14.6	14.8	15.0	15.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	15.4	16.4	17.5	18.3	19.1	20.2	21.5	22.5	22.8	23.4	23.8	24.0	24.1	24.3	24.4	24.6	24.8	24.8	24.9	24.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	24.3	23.4	20.7	14.6	7.7	3.7	1.9	1.1	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.8	0.9	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7
λnm	5000																			
τ	1.8																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.22) mm

ND1

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.3	0.4	0.5	0.6	0.6	0.7	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.8	0.7	0.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.5	1.9	2.6	3.3	4.1	4.7	5.2	5.7	6.0	6.3	6.5	6.7	6.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	7.1	7.2	7.3	7.3	7.4	7.4	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0	6.9	6.8	6.7	6.7	6.6	6.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	6.5	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.4	6.4	6.6	6.8	7.0	7.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.532	1.520	1.514	1.510	1.508	1.506	1.505
P	0.915	0.918	0.920	0.921	0.921	0.922	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

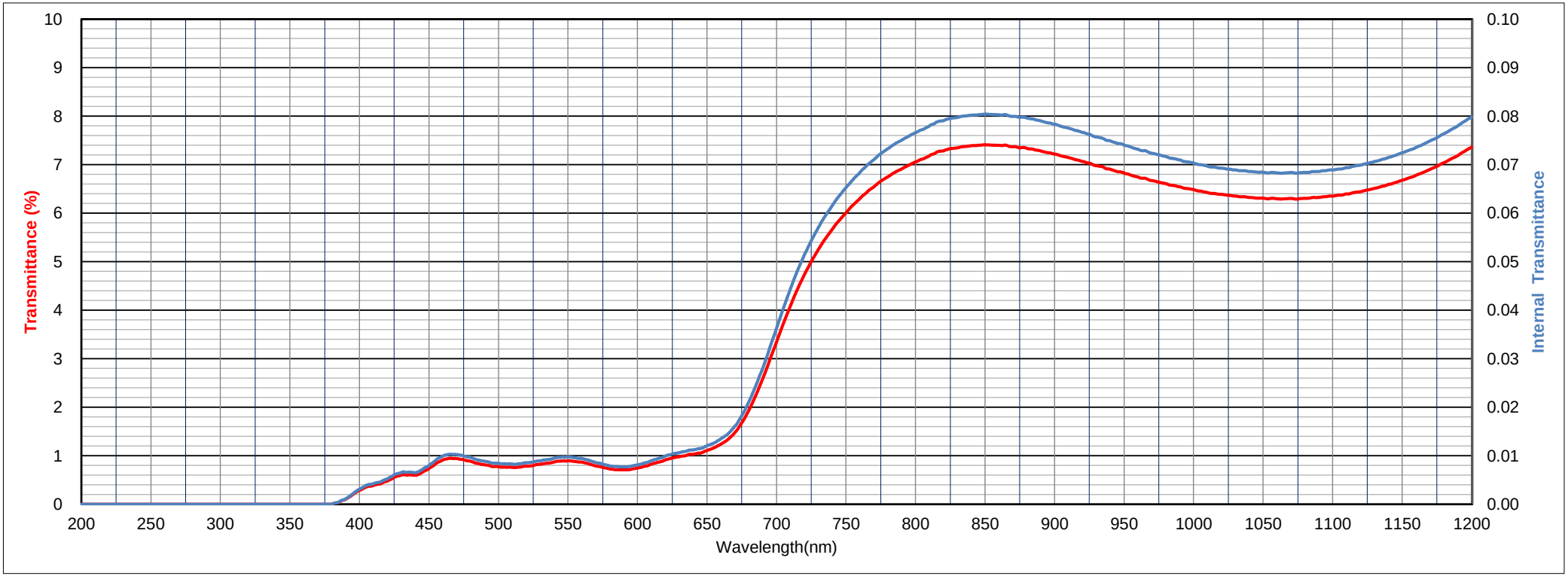
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
1±0.5	2 ±0.3



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HOYA

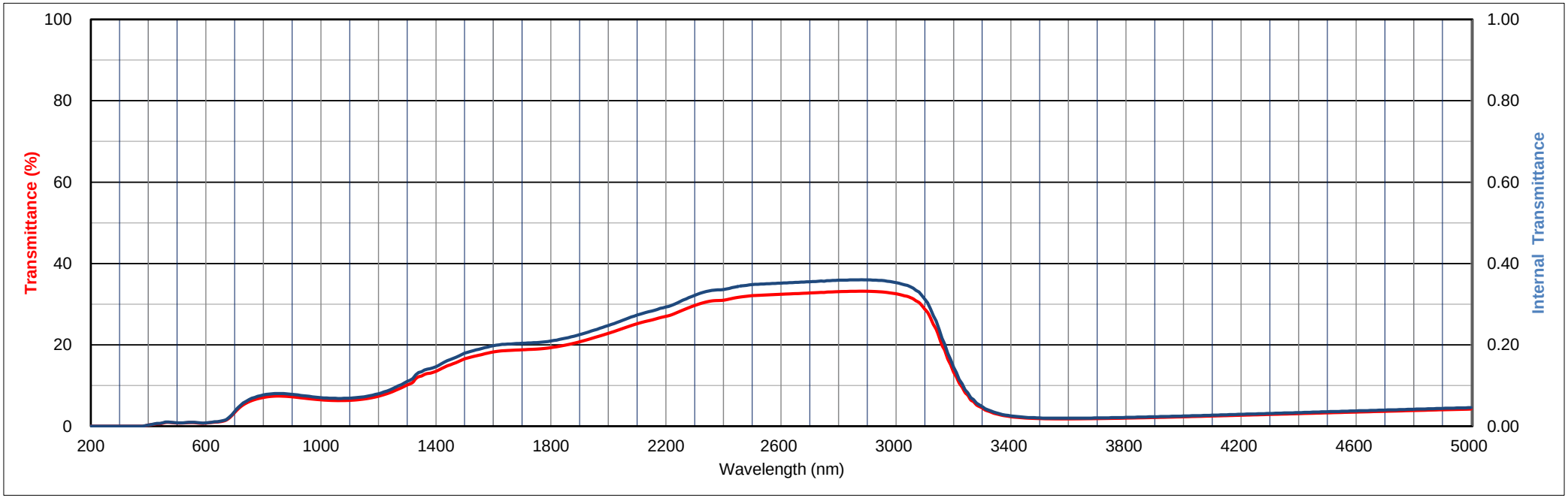
HOYA CORPORATION OPTICS SECTION

Thickness (2.22) mm

ND1

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.3	0.4	0.5	0.6	0.6	0.7	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.8	0.7	0.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.5	1.9	2.6	3.3	4.1	4.7	5.2	5.7	6.0	6.3	6.5	6.7	6.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	7.1	7.2	7.3	7.3	7.4	7.4	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0	6.9	6.8	6.7	6.7	6.6	6.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	6.5	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.4	6.4	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	7.4	7.6	7.8	8.0	8.2	8.5	8.8	9.1	9.4	9.8	10.1	10.4	10.8	11.7	12.2	12.3	12.7	12.9	13.0	13.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	13.5	13.8	14.2	14.5	14.9	15.1	15.4	15.6	15.9	16.3	16.6	16.8	16.9	17.1	17.3	17.5	17.6	17.8	18.0	18.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	18.3	18.4	18.5	18.5	18.6	18.6	18.6	18.7	18.7	18.7	18.8	18.8	18.9	18.9	18.9	19.0	19.0	19.1	19.1	19.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	19.3	19.4	19.5	19.7	19.8	19.9	20.1	20.2	20.4	20.6	20.7	20.9	21.1	21.3	21.5	21.8	22.0	22.2	22.4	22.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	22.8	24.0	25.2	26.1	27.0	28.3	29.7	30.7	31.0	31.7	32.1	32.3	32.4	32.6	32.8	32.9	33.1	33.2	33.2	33.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	32.6	31.6	28.8	21.9	13.3	7.6	4.5	3.0	2.3	2.0	1.9	1.8	1.8	1.8	1.9	1.9	2.0	2.1	2.1	2.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.8	3.9	4.0	4.1
λnm	5000																			
τ	4.2																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.65) mm

ND3

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	1.2	1.6	1.8	2.2	2.2	2.5	3.0	3.0	2.9	2.7	2.6	2.6	2.7	2.8	2.9	2.9	2.9	2.7	2.5	2.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	2.6	2.8	3.0	3.1	3.3	3.4	3.7	4.3	5.2	6.5	7.8	9.1	10.1	10.9	11.6	12.1	12.5	12.9	13.2	13.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.6	13.8	14.0	14.1	14.1	14.2	14.1	14.1	14.1	14.0	13.9	13.8	13.7	13.5	13.4	13.3	13.2	13.1	13.0	12.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	12.8	12.7	12.7	12.6	12.6	12.5	12.5	12.5	12.5	12.6	12.6	12.7	13.0	13.2	13.6	14.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.533	1.522	1.516	1.513	1.511	1.509	1.508
P	0.915	0.918	0.919	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

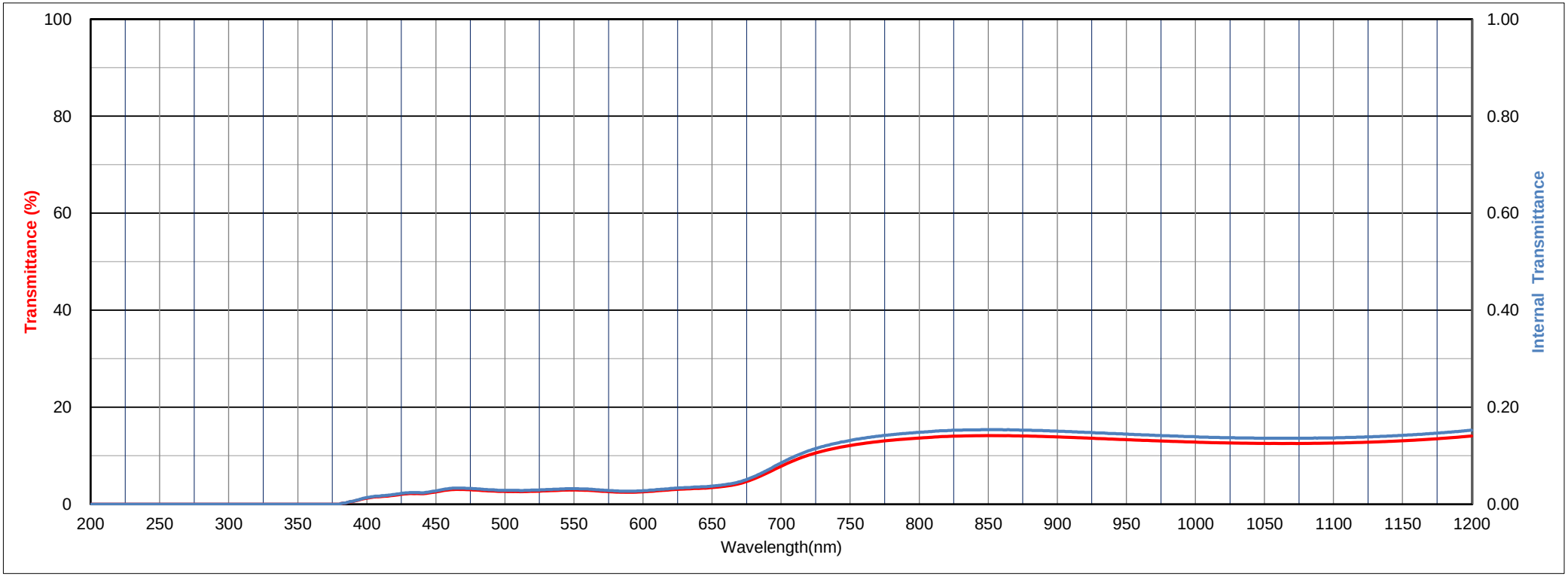
	x	y	Y	λ_d	P_e
A	0.460	0.405	3	600	7
C	0.319	0.325	3	578	5
D65	0.322	0.337	3	577	5

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
3±0.5	1.5 ±0.1



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HOYA

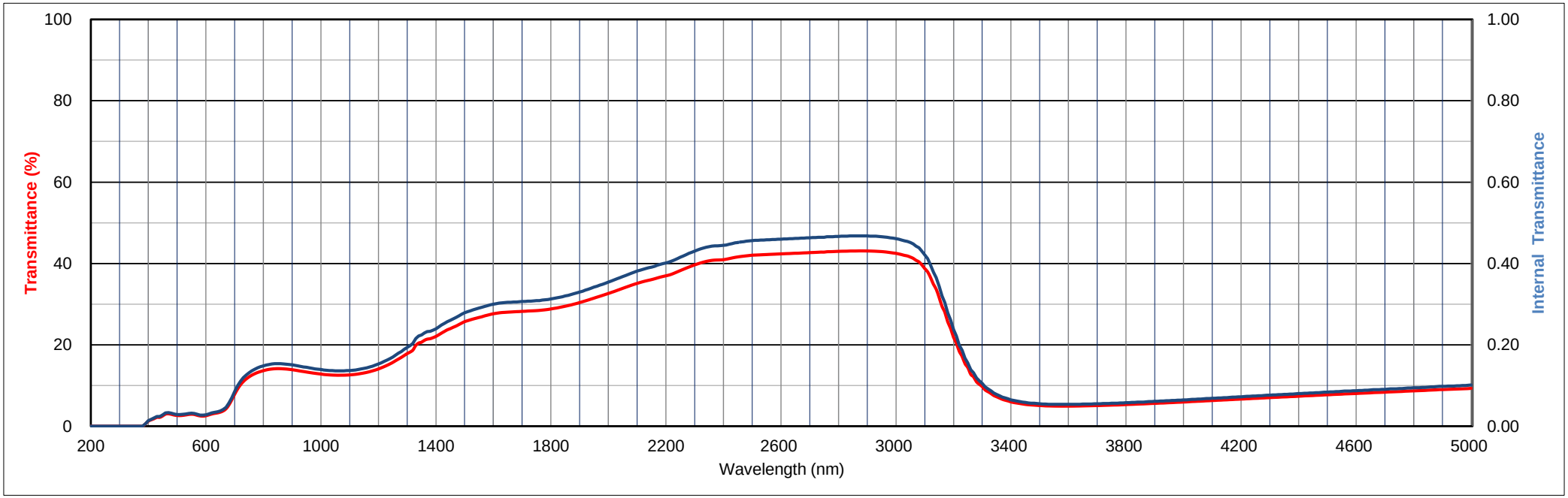
HOYA CORPORATION OPTICS SECTION

Thickness (1.65) mm

ND3

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	1.2	1.6	1.8	2.2	2.2	2.5	3.0	3.0	2.9	2.7	2.6	2.6	2.7	2.8	2.9	2.9	2.9	2.7	2.5	2.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	2.6	2.8	3.0	3.1	3.3	3.4	3.7	4.3	5.2	6.5	7.8	9.1	10.1	10.9	11.6	12.1	12.5	12.9	13.2	13.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.6	13.8	14.0	14.1	14.1	14.2	14.1	14.1	14.1	14.0	13.9	13.8	13.7	13.5	13.4	13.3	13.2	13.1	13.0	12.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	12.8	12.7	12.7	12.6	12.6	12.5	12.5	12.5	12.5	12.6	12.6	12.7	12.7	12.8	13.0	13.1	13.2	13.4	13.6	13.8
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	14.1	14.3	14.6	15.0	15.3	15.7	16.1	16.5	16.9	17.4	17.8	18.2	18.7	19.8	20.4	20.7	21.1	21.4	21.5	21.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	22.1	22.5	22.9	23.3	23.7	24.0	24.3	24.6	25.0	25.4	25.7	25.9	26.2	26.4	26.5	26.7	26.9	27.1	27.3	27.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	27.6	27.8	27.9	27.9	28.0	28.0	28.1	28.1	28.2	28.2	28.2	28.3	28.3	28.3	28.4	28.4	28.5	28.5	28.6	28.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	28.8	28.9	29.1	29.2	29.3	29.5	29.7	29.8	30.0	30.2	30.4	30.6	30.8	31.0	31.3	31.5	31.7	31.9	32.2	32.4
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	32.6	33.9	35.1	36.0	37.0	38.3	39.7	40.7	40.9	41.6	42.0	42.2	42.4	42.5	42.7	42.8	43.0	43.1	43.1	42.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	42.5	41.6	38.8	31.7	21.9	14.4	9.7	7.2	6.0	5.4	5.1	4.9	4.9	5.0	5.1	5.2	5.3	5.5	5.6	5.8
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	5.9	6.1	6.3	6.5	6.7	6.8	7.0	7.2	7.4	7.5	7.7	7.9	8.0	8.2	8.4	8.5	8.7	8.9	9.0	9.1
λnm	5000																			
T	9.3																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.41) mm

ND5

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	2.3	2.8	3.3	3.8	3.8	4.3	4.9	5.0	4.8	4.6	4.4	4.4	4.5	4.6	4.8	4.9	4.8	4.5	4.3	4.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	4.3	4.6	4.9	5.1	5.3	5.6	6.0	6.7	7.9	9.5	11.2	12.7	14.0	14.9	15.7	16.3	16.8	17.2	17.5	17.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	18.0	18.2	18.4	18.5	18.6	18.6	18.6	18.5	18.5	18.4	18.3	18.2	18.0	17.9	17.8	17.6	17.5	17.4	17.3	17.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	17.1	17.0	16.9	16.8	16.8	16.8	16.7	16.8	16.8	16.8	16.8	17.0	17.2	17.5	18.0	18.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.538	1.524	1.516	1.512	1.509	1.507	1.506
P	0.914	0.917	0.919	0.920	0.921	0.921	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

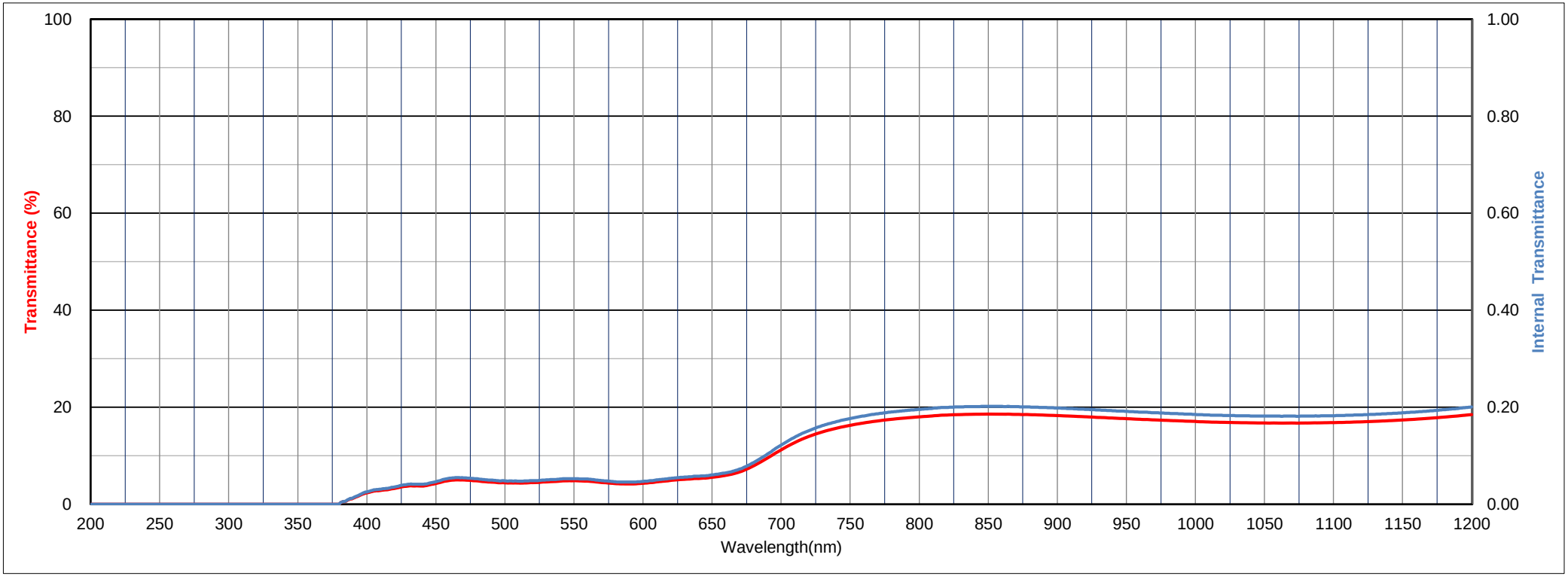
	x	y	Y	λ_d	P_e
A	0.458	0.406	5	599	6
C	0.318	0.324	5	577	4
D65	0.320	0.337	5	577	4

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
5±1	1.3±0.1



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HOYA

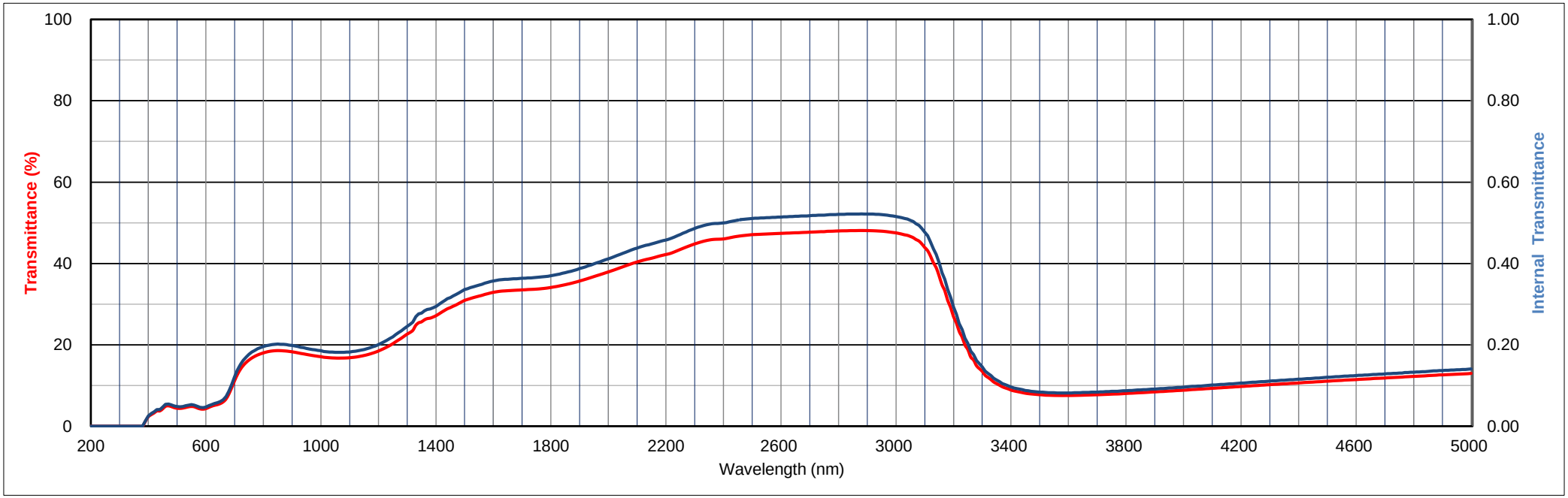
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness (1.41) mm

ND5

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	2.3	2.8	3.3	3.8	3.8	4.3	4.9	5.0	4.8	4.6	4.4	4.4	4.5	4.6	4.8	4.9	4.8	4.5	4.3	4.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	4.3	4.6	4.9	5.1	5.3	5.6	6.0	6.7	7.9	9.5	11.2	12.7	14.0	14.9	15.7	16.3	16.8	17.2	17.5	17.8
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	18.0	18.2	18.4	18.5	18.6	18.6	18.6	18.5	18.5	18.4	18.3	18.2	18.0	17.9	17.8	17.6	17.5	17.4	17.3	17.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	17.1	17.0	16.9	16.8	16.8	16.8	16.7	16.8	16.8	16.8	16.8	16.9	17.0	17.1	17.2	17.4	17.5	17.7	18.0	18.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	18.5	18.8	19.1	19.5	19.9	20.3	20.7	21.2	21.6	22.1	22.6	23.0	23.6	24.8	25.4	25.7	26.1	26.5	26.6	26.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	27.2	27.6	28.0	28.5	28.9	29.2	29.5	29.8	30.2	30.6	30.9	31.2	31.4	31.6	31.8	32.0	32.2	32.4	32.6	32.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	32.9	33.0	33.1	33.2	33.3	33.3	33.4	33.4	33.4	33.5	33.5	33.5	33.6	33.6	33.7	33.7	33.8	33.8	33.9	34.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	34.1	34.2	34.3	34.5	34.6	34.8	35.0	35.1	35.3	35.5	35.7	35.9	36.1	36.3	36.6	36.8	37.0	37.2	37.5	37.7
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	37.9	39.2	40.4	41.3	42.2	43.5	44.8	45.8	46.0	46.7	47.1	47.3	47.4	47.6	47.7	47.8	48.0	48.1	48.1	47.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	47.5	46.6	43.9	37.0	27.0	18.8	13.5	10.5	8.9	8.1	7.7	7.6	7.6	7.6	7.7	7.9	8.0	8.2	8.4	8.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	8.9	9.1	9.3	9.5	9.8	10.0	10.2	10.4	10.6	10.8	11.1	11.3	11.5	11.7	11.8	12.0	12.2	12.4	12.6	12.8
λnm	5000																			
T	13.0																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.75) mm

ND10

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.7	3.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	6.4	6.5	6.7	7.6	7.5	8.8	10.4	10.7	10.4	10.1	10.0	10.1	10.3	10.6	11.1	11.4	11.6	11.2	10.4	9.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	9.5	9.8	10.1	10.2	10.0	9.8	9.9	10.3	11.3	12.6	13.7	14.4	14.6	14.4	14.0	13.5	12.9	12.3	11.7	11.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	10.7	10.2	9.9	9.5	9.1	8.8	8.5	8.3	8.0	7.8	7.5	7.3	7.1	6.9	6.7	6.5	6.3	6.2	6.0	5.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0	5.0	4.9	4.9	4.8	4.8	4.8	4.9	5.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.529	1.520	1.516	1.513	1.512	1.511	1.510
P	0.916	0.918	0.919	0.920	0.920	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

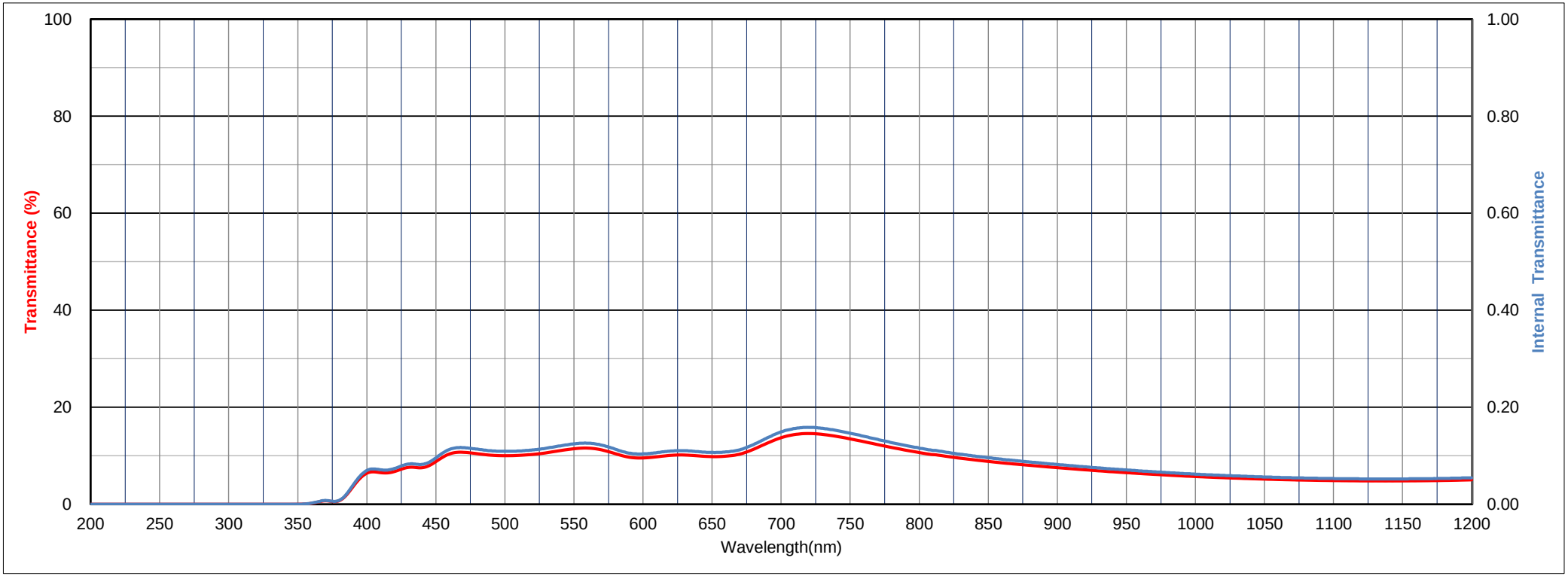
	x	y	Y	λ_d	P_e
A	0.447	0.420	11	569	8
C	0.316	0.340	11	562	8
D65	0.318	0.352	11	561	8

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	3	490	565	-	65	530	100	2.41

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
10±2	1±0.1



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

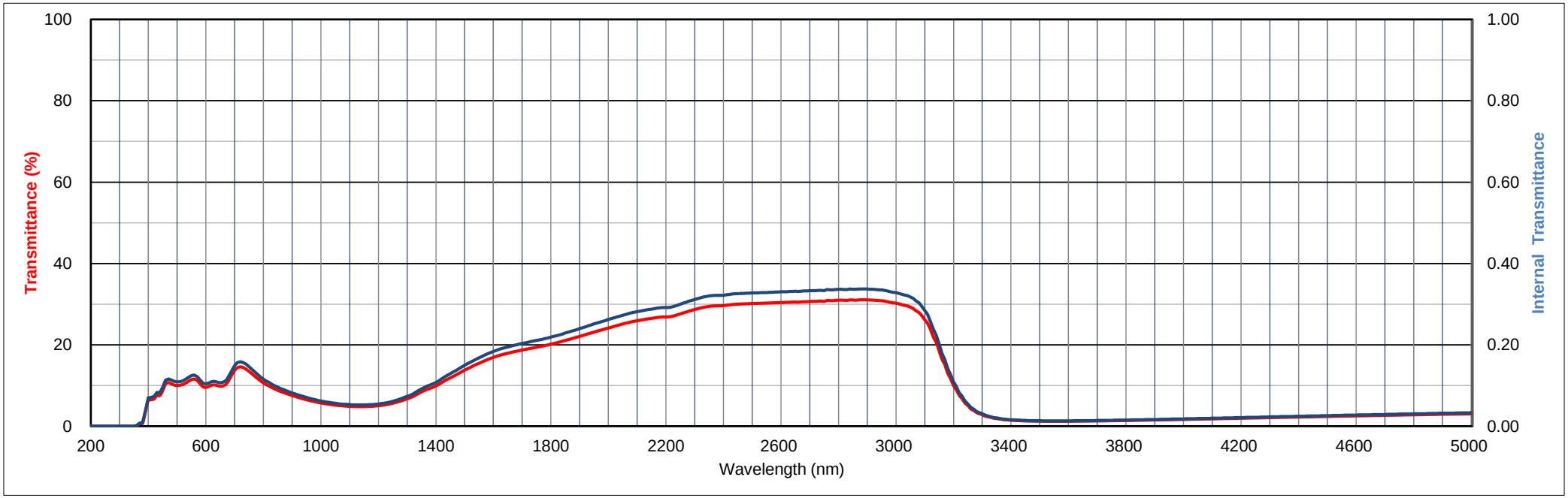
HOYA CORPORATION OPTICS SECTION

Thickness (2.75) mm

ND10

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.7	3.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	6.4	6.5	6.7	7.6	7.5	8.8	10.4	10.7	10.4	10.1	10.0	10.1	10.3	10.6	11.1	11.4	11.6	11.2	10.4	9.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	9.5	9.8	10.1	10.2	10.0	9.8	9.9	10.3	11.3	12.6	13.7	14.4	14.6	14.4	14.0	13.5	12.9	12.3	11.7	11.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	10.7	10.2	9.9	9.5	9.1	8.8	8.5	8.3	8.0	7.8	7.5	7.3	7.1	6.9	6.7	6.5	6.3	6.2	6.0	5.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0	5.0	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.9	4.9	5.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	5.0	5.1	5.2	5.3	5.5	5.6	5.8	6.0	6.2	6.5	6.7	7.0	7.3	7.7	8.1	8.4	8.8	9.1	9.3	9.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	9.9	10.3	10.7	11.1	11.6	11.9	12.3	12.6	13.0	13.4	13.8	14.1	14.5	14.8	15.2	15.5	15.8	16.1	16.4	16.7
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	16.9	17.2	17.4	17.6	17.8	17.9	18.1	18.3	18.4	18.6	18.7	18.9	19.0	19.1	19.3	19.4	19.5	19.7	19.8	20.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	20.1	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.7	21.9	22.1	22.3	22.5	22.7	22.9	23.1	23.3	23.5	23.7	23.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	24.1	25.1	25.9	26.5	26.8	27.6	28.7	29.5	29.6	30.0	30.2	30.3	30.4	30.5	30.7	30.7	31.0	31.0	31.0	30.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	30.2	29.2	26.2	18.6	10.0	5.1	2.8	1.9	1.5	1.3	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.5	1.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	1.7	1.7	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0
λnm	5000																			
T	3.1																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.42) mm

ND13

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	1.3	5.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	8.8	8.9	9.2	10.2	10.2	11.6	13.5	13.9	13.5	13.2	13.1	13.1	13.4	13.7	14.3	14.7	14.8	14.4	13.5	12.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	12.5	12.8	13.1	13.2	13.0	12.8	13.0	13.4	14.6	16.0	17.2	18.0	18.2	18.0	17.6	17.0	16.3	15.7	15.0	14.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.8	13.3	12.9	12.5	12.1	11.7	11.4	11.1	10.8	10.5	10.2	9.9	9.7	9.4	9.2	8.9	8.7	8.5	8.3	8.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	8.0	7.8	7.7	7.6	7.4	7.3	7.2	7.1	7.1	7.0	6.9	6.9	6.9	6.9	7.0	7.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.539	1.523	1.516	1.512	1.509	1.508	1.507
P	0.914	0.918	0.919	0.920	0.921	0.921	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

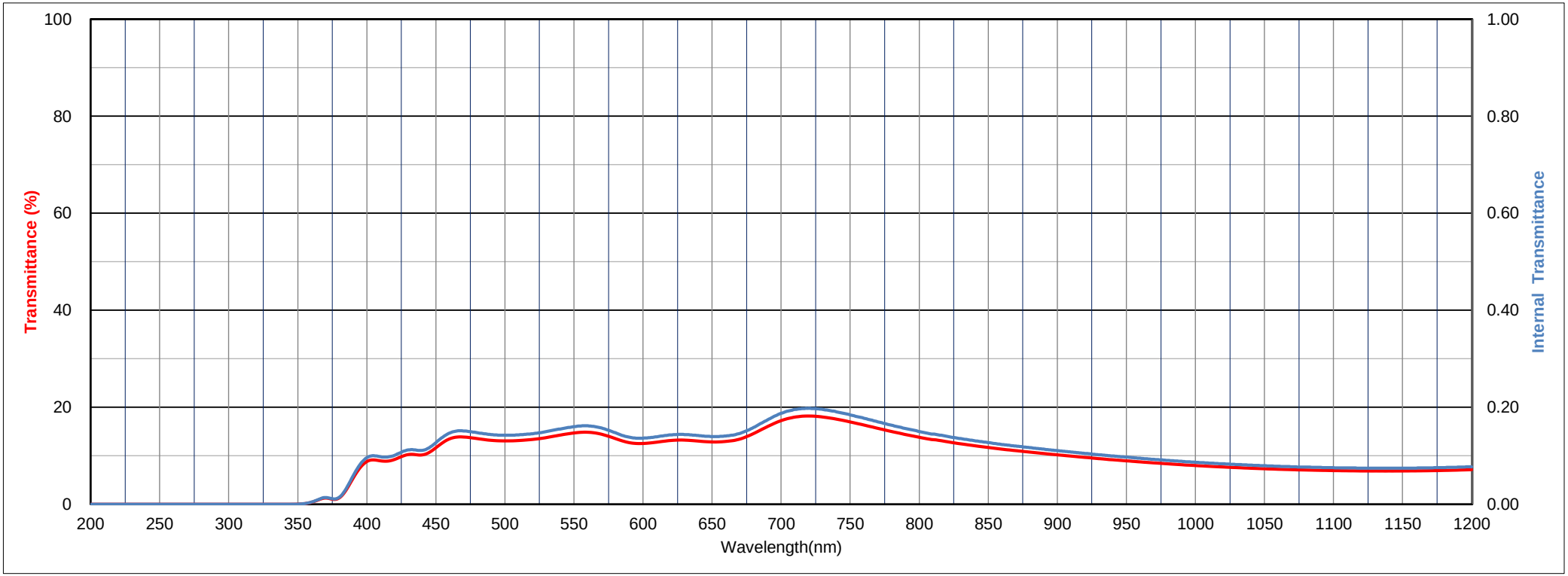
	x	y	Y	λ_d	P_e
A	0.447	0.419	14	569	7
C	0.315	0.337	14	562	7
D65	0.318	0.350	14	561	7

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	535	595	58	68	530	100	2.43

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
12.5±2	0.90±0.1



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The content of this catalog is accurate as of October ,2020

HOYA

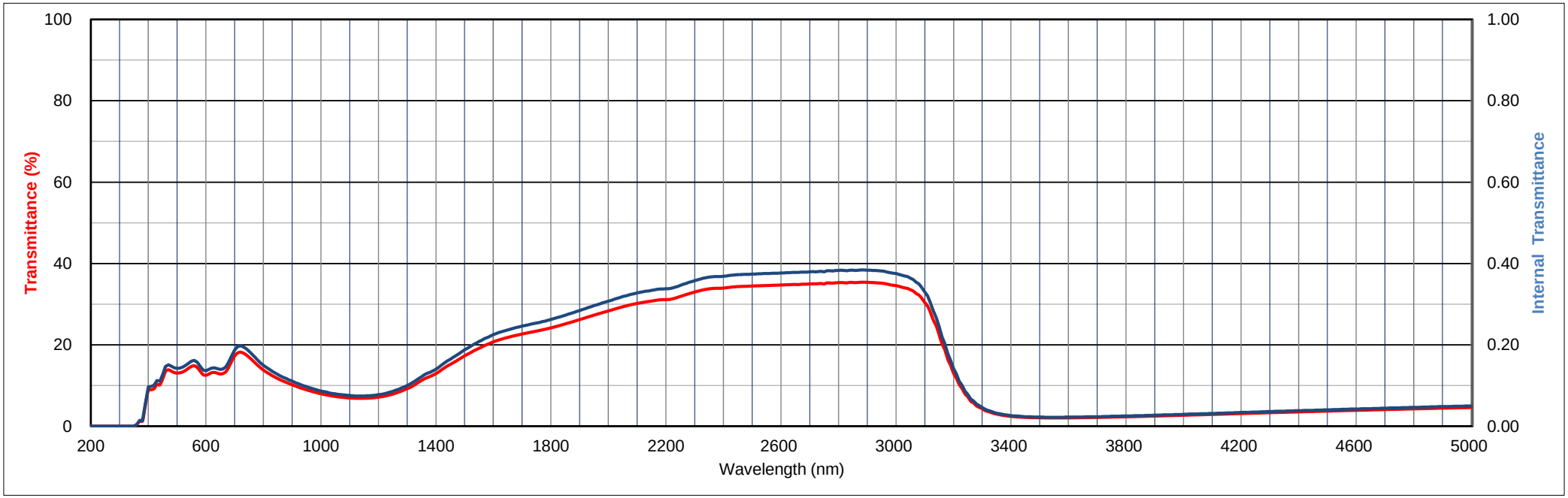
HOYA CORPORATION OPTICS SECTION

Thickness (2.42) mm

ND13

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.3	1.3	5.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	8.8	8.9	9.2	10.2	10.2	11.6	13.5	13.9	13.5	13.2	13.1	13.1	13.4	13.7	14.3	14.7	14.8	14.4	13.5	12.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	12.5	12.8	13.1	13.2	13.0	12.8	13.0	13.4	14.6	16.0	17.2	18.0	18.2	18.0	17.6	17.0	16.3	15.7	15.0	14.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.8	13.3	12.9	12.5	12.1	11.7	11.4	11.1	10.8	10.5	10.2	9.9	9.7	9.4	9.2	8.9	8.7	8.5	8.3	8.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	8.0	7.8	7.7	7.6	7.4	7.3	7.2	7.1	7.1	7.0	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	7.0	7.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	7.1	7.2	7.4	7.5	7.7	7.9	8.1	8.4	8.6	8.9	9.2	9.5	9.9	10.3	10.8	11.2	11.6	12.0	12.2	12.6
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	12.9	13.4	13.9	14.4	14.8	15.2	15.6	16.0	16.4	16.9	17.3	17.7	18.1	18.5	18.8	19.1	19.5	19.8	20.1	20.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	20.7	21.0	21.2	21.4	21.6	21.8	22.0	22.2	22.3	22.5	22.7	22.8	23.0	23.1	23.2	23.4	23.5	23.7	23.8	24.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	24.2	24.4	24.5	24.7	24.9	25.2	25.4	25.6	25.8	26.0	26.2	26.4	26.6	26.9	27.1	27.3	27.5	27.7	27.9	28.1
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	28.3	29.4	30.2	30.8	31.1	31.9	33.0	33.8	33.9	34.3	34.5	34.6	34.7	34.8	35.0	35.0	35.3	35.3	35.4	35.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	34.6	33.6	30.4	22.5	13.1	7.2	4.3	3.0	2.4	2.2	2.1	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.5	2.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.4	4.5
λnm	5000																			
T	4.6																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.24) mm

ND15

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.8	1.8	6.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.5	10.6	10.9	12.0	12.0	13.6	15.5	15.9	15.6	15.2	15.1	15.2	15.4	15.8	16.4	16.8	17.0	16.6	15.6	14.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	14.5	14.8	15.2	15.3	15.1	14.9	15.0	15.5	16.7	18.2	19.5	20.3	20.5	20.3	19.8	19.2	18.6	17.8	17.1	16.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	15.9	15.4	14.9	14.4	14.0	13.6	13.3	12.9	12.6	12.3	12.0	11.7	11.4	11.1	10.9	10.6	10.4	10.2	10.0	9.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	9.6	9.4	9.2	9.1	8.9	8.8	8.7	8.6	8.5	8.5	8.4	8.3	8.3	8.3	8.4	8.6				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.538	1.527	1.521	1.518	1.515	1.514	1.513
P	0.914	0.917	0.918	0.919	0.919	0.920	0.920

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

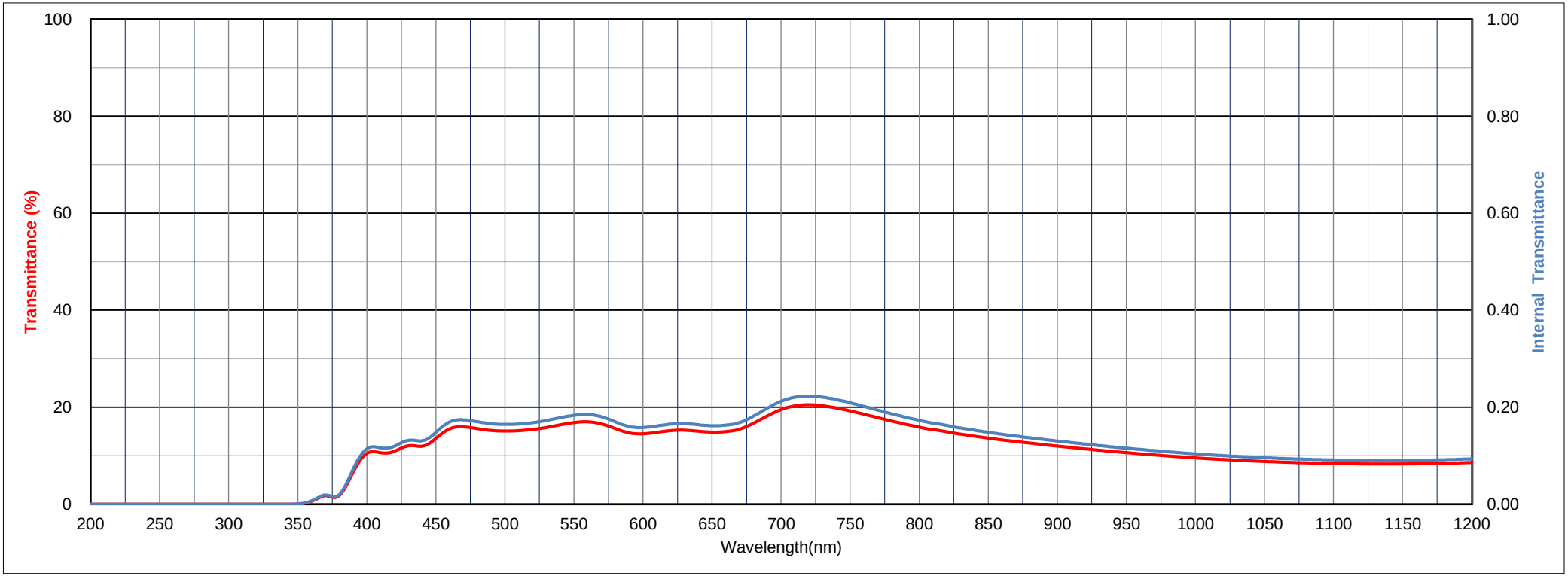
	x	y	Y	λ_d	P_e
A	0.447	0.418	16	569	7
C	0.315	0.336	16	562	7
D65	0.317	0.348	16	561	7

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	535	595	58	68	530	100	2.43

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
15±2	0.82±0.1



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HOYA

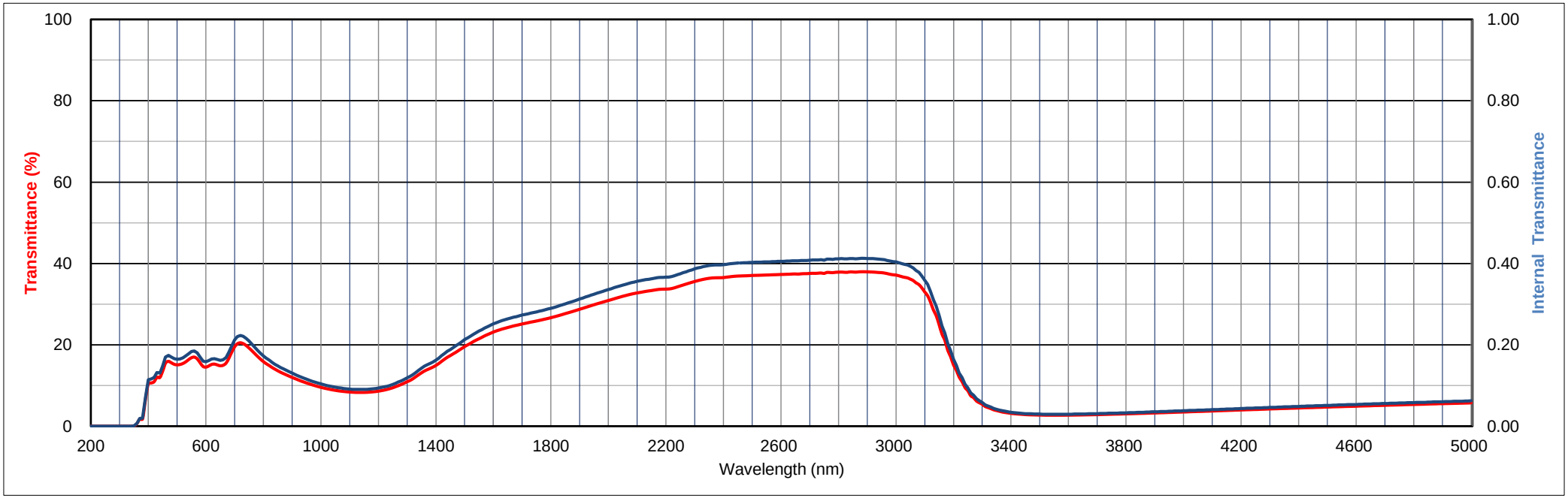
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness (2.24) mm

ND15

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	1.8	1.8	6.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.5	10.6	10.9	12.0	12.0	13.6	15.5	15.9	15.6	15.2	15.1	15.2	15.4	15.8	16.4	16.8	17.0	16.6	15.6	14.7
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	14.5	14.8	15.2	15.3	15.1	14.9	15.0	15.5	16.7	18.2	19.5	20.3	20.5	20.3	19.8	19.2	18.6	17.8	17.1	16.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	15.9	15.4	14.9	14.4	14.0	13.6	13.3	12.9	12.6	12.3	12.0	11.7	11.4	11.1	10.9	10.6	10.4	10.2	10.0	9.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	9.6	9.4	9.2	9.1	8.9	8.8	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.3	8.3	8.3	8.4	8.4	8.5
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	8.6	8.7	8.9	9.0	9.2	9.5	9.7	10.0	10.3	10.6	10.9	11.2	11.7	12.2	12.7	13.1	13.6	13.9	14.2	14.5
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	14.9	15.4	16.0	16.5	17.0	17.3	17.8	18.2	18.7	19.1	19.6	20.0	20.4	20.8	21.2	21.5	21.8	22.2	22.5	22.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	23.1	23.4	23.6	23.9	24.1	24.3	24.5	24.6	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	26.0	26.2	26.3	26.5
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	26.7	26.9	27.1	27.3	27.5	27.7	27.9	28.1	28.3	28.5	28.8	29.0	29.2	29.4	29.6	29.9	30.1	30.3	30.5	30.7
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	30.9	31.9	32.8	33.4	33.7	34.5	35.6	36.4	36.5	36.9	37.1	37.2	37.3	37.4	37.6	37.6	37.9	37.9	37.9	37.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	37.1	36.1	33.0	24.9	15.1	8.7	5.4	3.8	3.1	2.9	2.7	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.3	3.4
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	3.5	3.6	3.7	3.9	4.0	4.1	4.2	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6
λnm	5000																			
T	5.7																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (3.06) mm

ND20

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	2.6	2.3	9.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	14.8	14.7	14.9	16.4	16.3	18.5	21.3	21.9	21.6	21.2	21.1	21.3	21.5	21.9	22.4	23.0	23.2	22.7	21.4	20.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	19.8	19.9	20.1	20.0	19.5	19.0	18.9	19.2	20.2	21.3	22.0	22.2	21.8	21.1	20.1	19.0	17.9	16.9	15.9	15.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	14.2	13.6	13.0	12.4	11.9	11.5	11.0	10.6	10.3	10.0	9.6	9.4	9.0	8.8	8.5	8.3	8.1	7.9	7.7	7.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	7.3	7.1	7.0	6.9	6.8	6.6	6.5	6.5	6.4	6.3	6.3	6.2	6.2	6.2	6.3	6.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.533	1.520	1.513	1.509	1.506	1.504	1.503
P	0.915	0.918	0.920	0.921	0.922	0.922	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

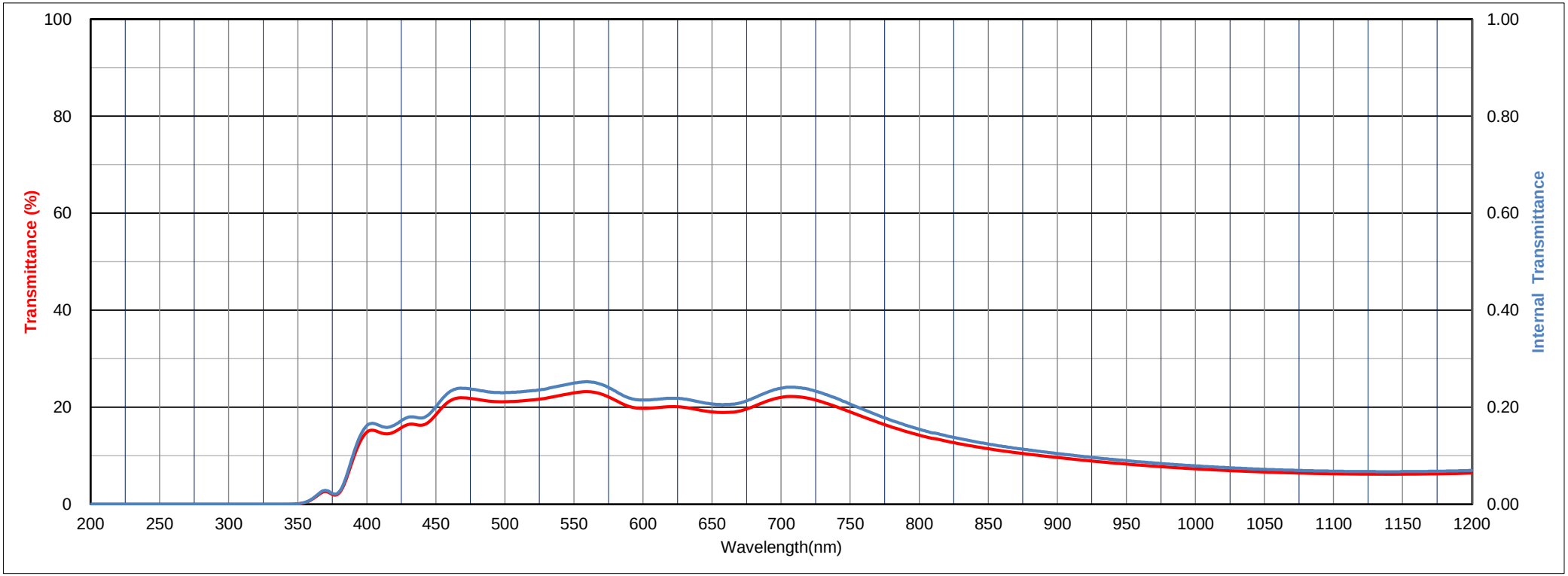
	x	y	Y	λ_d	P_e
A	0.443	0.420	21	559	6
C	0.312	0.337	22	556	6
D65	0.314	0.349	22	555	6

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	535	595	58	68	530	100	2.43

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
20±2	0.70±0.05



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

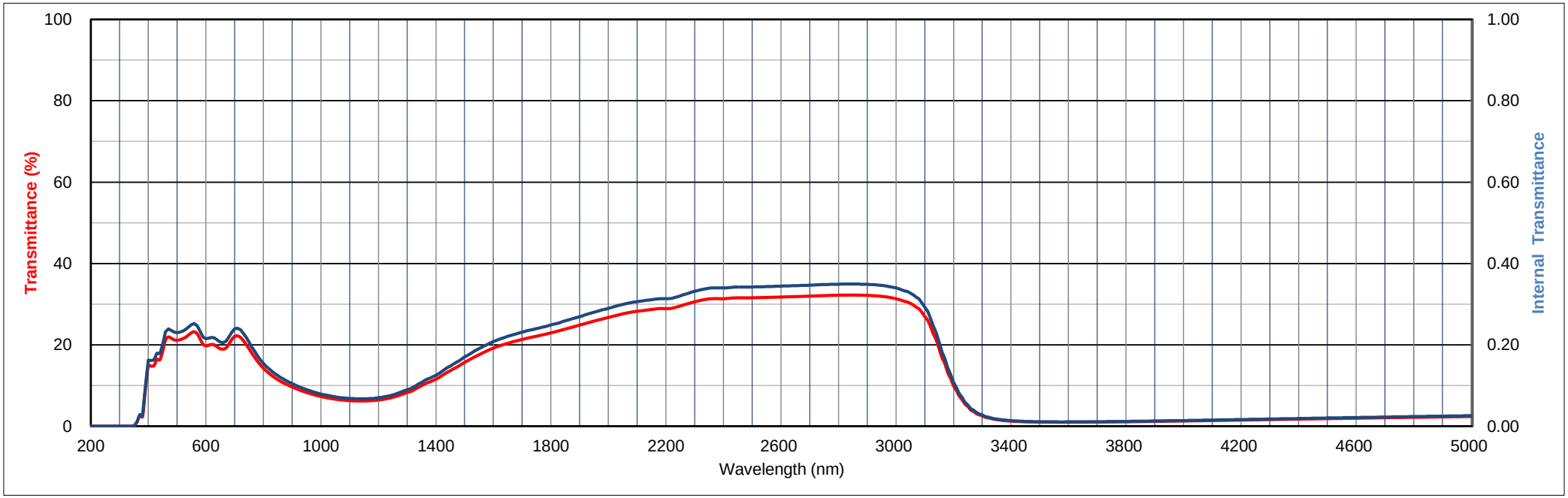
HOYA CORPORATION OPTICS SECTION

Thickness (3.06) mm

ND20

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	2.6	2.3	9.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	14.8	14.7	14.9	16.4	16.3	18.5	21.3	21.9	21.6	21.2	21.1	21.3	21.5	21.9	22.4	23.0	23.2	22.7	21.4	20.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	19.8	19.9	20.1	20.0	19.5	19.0	18.9	19.2	20.2	21.3	22.0	22.2	21.8	21.1	20.1	19.0	17.9	16.9	15.9	15.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	14.2	13.6	13.0	12.4	11.9	11.5	11.0	10.6	10.3	10.0	9.6	9.4	9.0	8.8	8.5	8.3	8.1	7.9	7.7	7.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	7.3	7.1	7.0	6.9	6.8	6.6	6.5	6.5	6.4	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2	6.3	6.3	6.4
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	6.4	6.5	6.6	6.8	6.9	7.1	7.3	7.5	7.8	8.0	8.3	8.5	8.8	9.2	9.6	9.9	10.3	10.7	10.9	11.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	11.6	11.9	12.4	12.8	13.3	13.6	14.1	14.4	14.8	15.3	15.7	16.1	16.5	16.9	17.2	17.6	17.9	18.3	18.6	18.9
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	19.2	19.5	19.7	20.0	20.2	20.4	20.6	20.8	21.0	21.2	21.3	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	22.9	23.1	23.3	23.5	23.7	23.9	24.1	24.3	24.5	24.7	24.9	25.1	25.2	25.5	25.6	25.8	26.0	26.2	26.4	26.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	26.7	27.6	28.3	28.7	28.9	29.6	30.6	31.3	31.3	31.6	31.6	31.7	31.8	31.9	32.0	32.1	32.2	32.2	32.2	31.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	31.3	30.2	27.0	19.0	9.9	4.8	2.6	1.6	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3
λnm	5000																			
T	2.4																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.61) mm

ND25

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.9	4.4	4.0	13.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	19.4	19.3	19.5	21.2	21.0	23.4	26.4	27.1	26.7	26.3	26.2	26.4	26.6	27.0	27.6	28.2	28.4	27.9	26.6	25.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	24.8	24.9	25.2	25.0	24.5	24.0	23.9	24.2	25.2	26.4	27.2	27.4	27.0	26.2	25.1	24.0	22.8	21.7	20.6	19.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	18.7	18.0	17.3	16.7	16.1	15.6	15.1	14.6	14.2	13.8	13.4	13.1	12.7	12.4	12.1	11.8	11.5	11.3	11.0	10.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	10.6	10.4	10.2	10.1	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.2	9.2	9.3	9.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.536	1.523	1.516	1.512	1.510	1.508	1.507
P	0.915	0.918	0.919	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

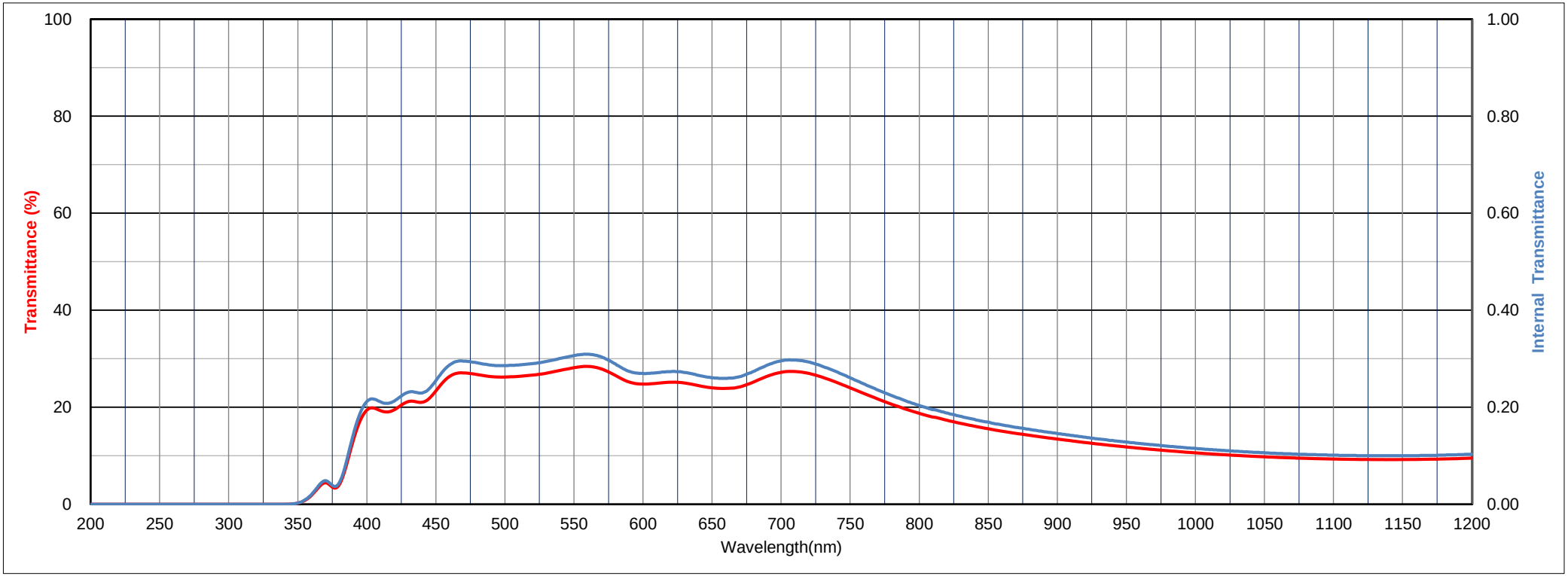
	x	y	Y	λ_d	P_e
A	0.444	0.418	26	559	5
C	0.312	0.334	27	556	5
D65	0.314	0.346	27	555	5

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	535	600	62	66	550	100	2.42

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
25±2.5	0.60±0.05



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The content of this catalog is accurate as of October ,2020

HOYA

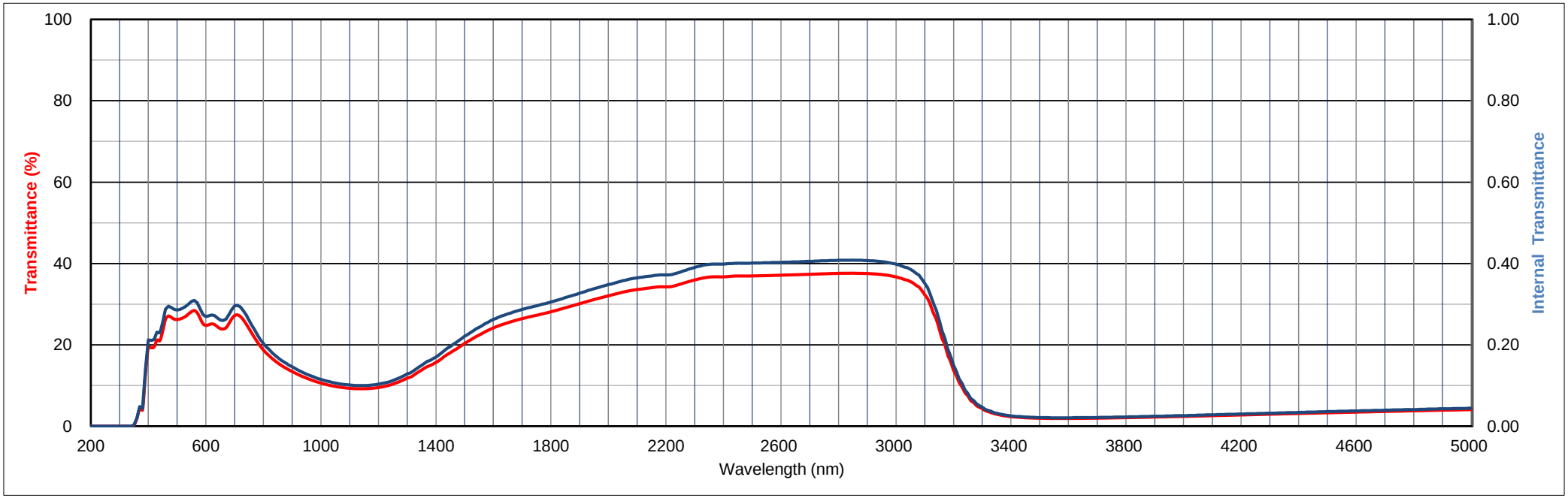
HOYA CORPORATION OPTICS SECTION

Thickness (2.61) mm

ND25

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.9	4.4	4.0	13.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	19.4	19.3	19.5	21.2	21.0	23.4	26.4	27.1	26.7	26.3	26.2	26.4	26.6	27.0	27.6	28.2	28.4	27.9	26.6	25.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	24.8	24.9	25.2	25.0	24.5	24.0	23.9	24.2	25.2	26.4	27.2	27.4	27.0	26.2	25.1	24.0	22.8	21.7	20.6	19.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	18.7	18.0	17.3	16.7	16.1	15.6	15.1	14.6	14.2	13.8	13.4	13.1	12.7	12.4	12.1	11.8	11.5	11.3	11.0	10.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	10.6	10.4	10.2	10.1	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.3	9.2	9.2	9.2	9.2	9.2	9.3	9.3	9.4
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	9.5	9.6	9.8	9.9	10.1	10.3	10.6	10.9	11.2	11.5	11.8	12.0	12.4	12.9	13.4	13.8	14.2	14.6	14.9	15.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	15.7	16.1	16.6	17.2	17.6	18.1	18.5	18.9	19.4	19.9	20.4	20.8	21.2	21.6	22.0	22.4	22.8	23.2	23.5	23.9
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	24.2	24.5	24.7	25.0	25.2	25.4	25.6	25.9	26.1	26.3	26.4	26.6	26.8	27.0	27.1	27.3	27.4	27.6	27.8	27.9
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	28.1	28.3	28.5	28.7	28.9	29.1	29.3	29.5	29.7	29.9	30.1	30.3	30.5	30.7	30.9	31.1	31.3	31.5	31.7	31.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	32.1	33.0	33.6	34.0	34.3	34.9	36.0	36.7	36.7	36.9	36.9	37.0	37.1	37.2	37.3	37.5	37.6	37.6	37.5	37.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	36.7	35.5	32.3	24.0	13.8	7.5	4.3	2.9	2.3	2.1	2.0	1.9	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	2.4	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.7	3.8	3.9	3.9	4.0
λnm	5000																			
T	4.1																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.24) mm

ND30

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.2	6.8	6.2	17.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	24.2	24.0	24.3	26.0	25.9	28.4	31.5	32.2	31.8	31.4	31.3	31.5	31.7	32.1	32.7	33.3	33.6	33.0	31.7	30.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	29.8	30.0	30.2	30.1	29.5	29.0	28.9	29.2	30.3	31.5	32.3	32.5	32.1	31.3	30.2	29.0	27.8	26.6	25.5	24.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	23.5	22.7	22.0	21.2	20.6	20.0	19.5	19.0	18.5	18.1	17.7	17.3	16.8	16.5	16.1	15.8	15.5	15.2	14.9	14.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	14.4	14.2	14.0	13.8	13.6	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.8	12.8	12.9	13.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.538	1.524	1.517	1.513	1.510	1.508	1.507
P	0.914	0.917	0.919	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

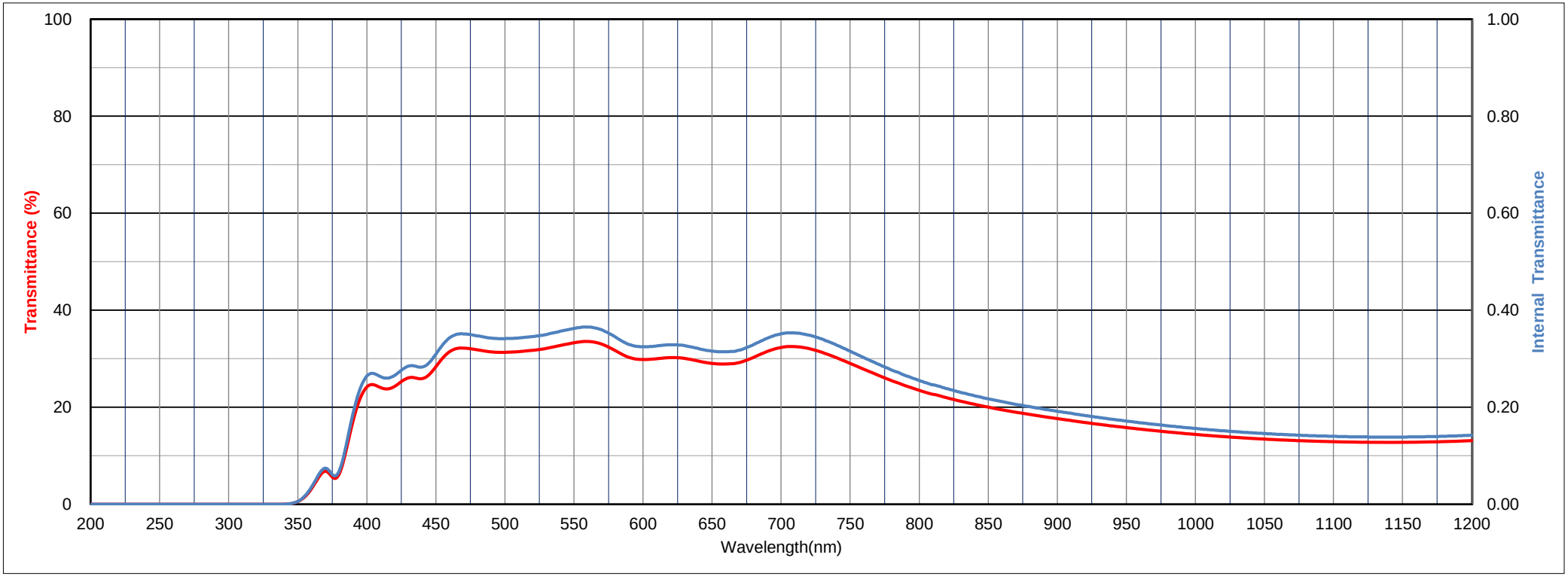
	x	y	Y	λ_d	P_e
A	0.444	0.417	32	560	4
C	0.312	0.332	32	556	5
D65	0.314	0.344	32	556	5

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	2	535	600	62	66	550	100	2.42

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
30±3	0.52±0.05



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

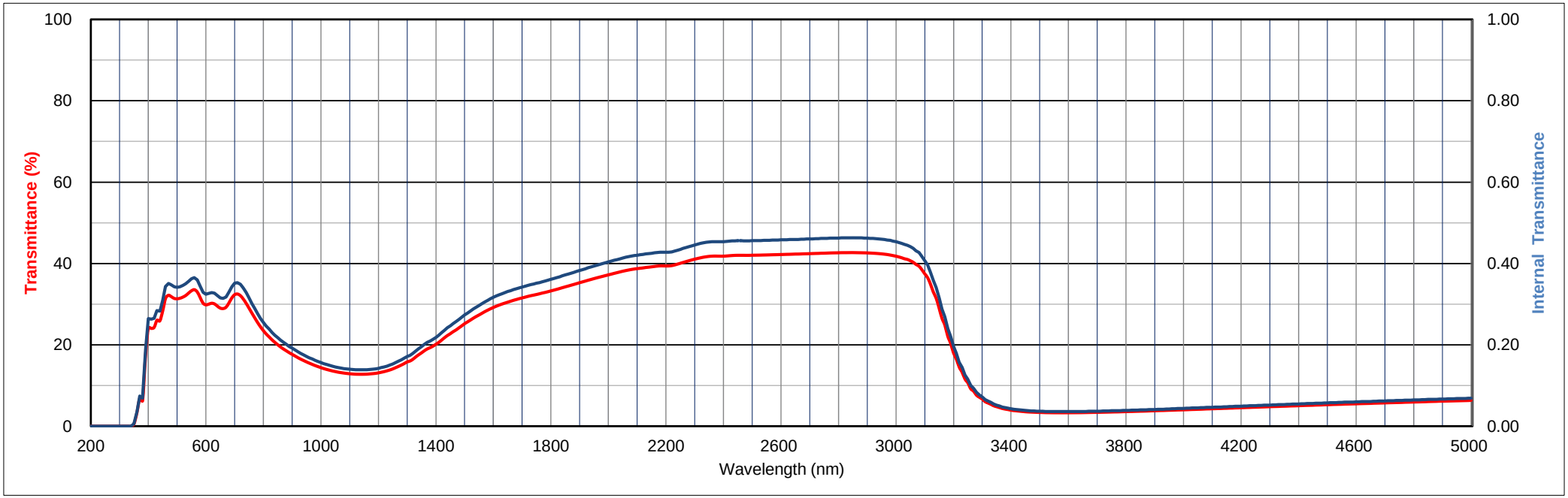
HOYA CORPORATION OPTICS SECTION

Thickness (2.24) mm

ND30

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.2	6.8	6.2	17.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	24.2	24.0	24.3	26.0	25.9	28.4	31.5	32.2	31.8	31.4	31.3	31.5	31.7	32.1	32.7	33.3	33.6	33.0	31.7	30.3
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	29.8	30.0	30.2	30.1	29.5	29.0	28.9	29.2	30.3	31.5	32.3	32.5	32.1	31.3	30.2	29.0	27.8	26.6	25.5	24.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	23.5	22.7	22.0	21.2	20.6	20.0	19.5	19.0	18.5	18.1	17.7	17.3	16.8	16.5	16.1	15.8	15.5	15.2	14.9	14.6
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	14.4	14.2	14.0	13.8	13.6	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.8	12.8	12.8	12.8	12.8	12.9	12.9	13.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	13.1	13.3	13.4	13.6	13.8	14.1	14.4	14.7	15.0	15.4	15.8	16.0	16.5	17.0	17.6	18.0	18.6	19.0	19.3	19.7
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	20.1	20.6	21.2	21.8	22.3	22.7	23.2	23.7	24.2	24.7	25.2	25.6	26.1	26.5	27.0	27.3	27.8	28.2	28.5	28.9
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	29.2	29.5	29.8	30.0	30.3	30.5	30.7	31.0	31.1	31.4	31.5	31.7	31.9	32.1	32.2	32.4	32.5	32.7	32.9	33.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	33.3	33.4	33.6	33.8	34.1	34.3	34.5	34.7	34.9	35.1	35.3	35.5	35.7	35.9	36.1	36.3	36.5	36.7	36.8	37.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	37.2	38.1	38.7	39.2	39.4	40.0	41.1	41.7	41.8	42.0	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.6	42.4
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	41.8	40.7	37.5	29.0	18.0	10.6	6.7	4.8	3.9	3.6	3.4	3.3	3.3	3.3	3.4	3.5	3.6	3.7	3.8	3.9
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	4.0	4.2	4.3	4.4	4.5	4.7	4.8	4.9	5.0	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.1	6.1	6.2
λnm	5000																			
T	6.4																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.73) mm

ND40

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.1	8.4	14.0	13.0	27.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	34.0	33.4	33.7	35.4	34.9	37.4	40.4	40.9	40.5	40.1	40.1	40.3	40.7	41.1	41.5	41.7	41.6	41.1	40.3	39.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	39.7	40.0	40.3	40.3	40.0	39.8	39.9	40.3	41.3	42.5	43.3	43.6	43.5	43.1	42.4	41.7	40.8	39.9	39.0	38.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	37.1	36.4	35.7	34.9	34.2	33.5	32.8	32.1	31.5	30.9	30.4	29.8	29.2	28.7	28.2	27.7	27.3	26.8	26.4	26.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	25.7	25.4	25.1	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.9	23.8	24.0	24.2	24.5	25.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.509	1.507	1.506	1.506	1.505	1.505	1.505
P	0.921	0.921	0.922	0.922	0.922	0.922	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

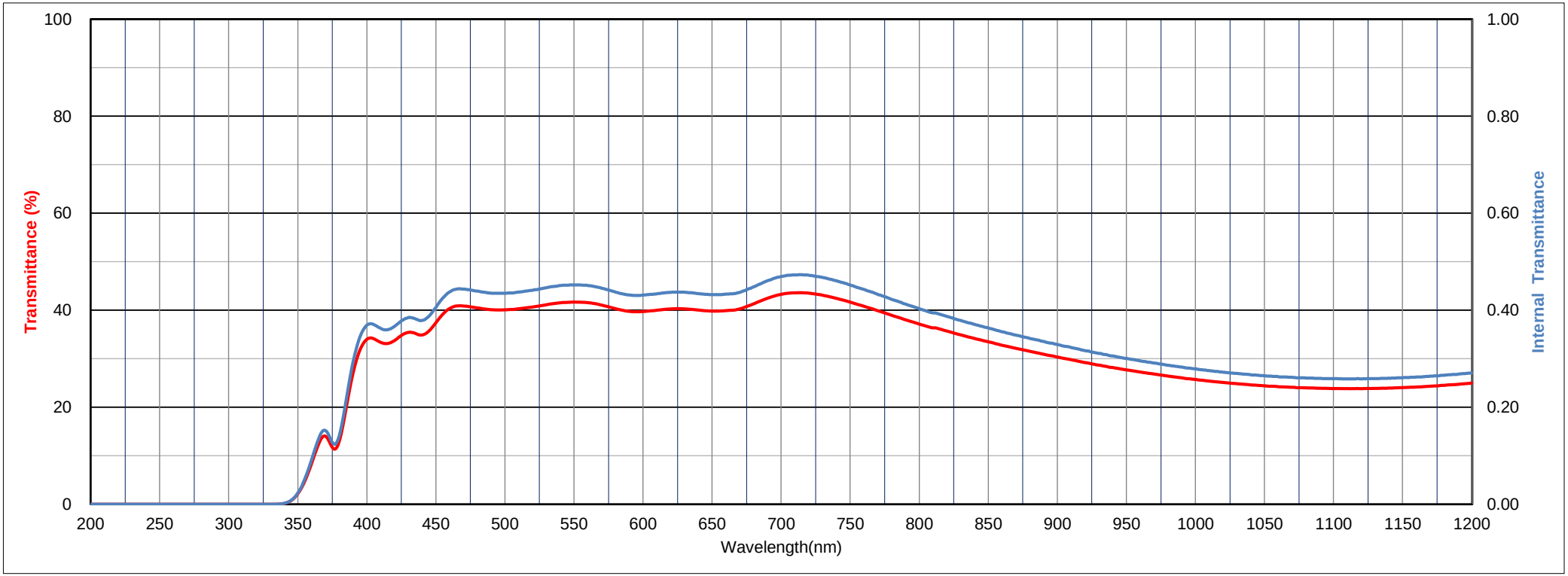
	x	y	Y	λ_d	P_e
A	0.448	0.413	41	573	4
C	0.313	0.327	41	564	4
D65	0.316	0.339	41	563	4

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	3	525	570	61	65	550	100	2.42

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
40±4	0.40±0.05



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The content of this catalog is accurate as of October ,2020

HOYA

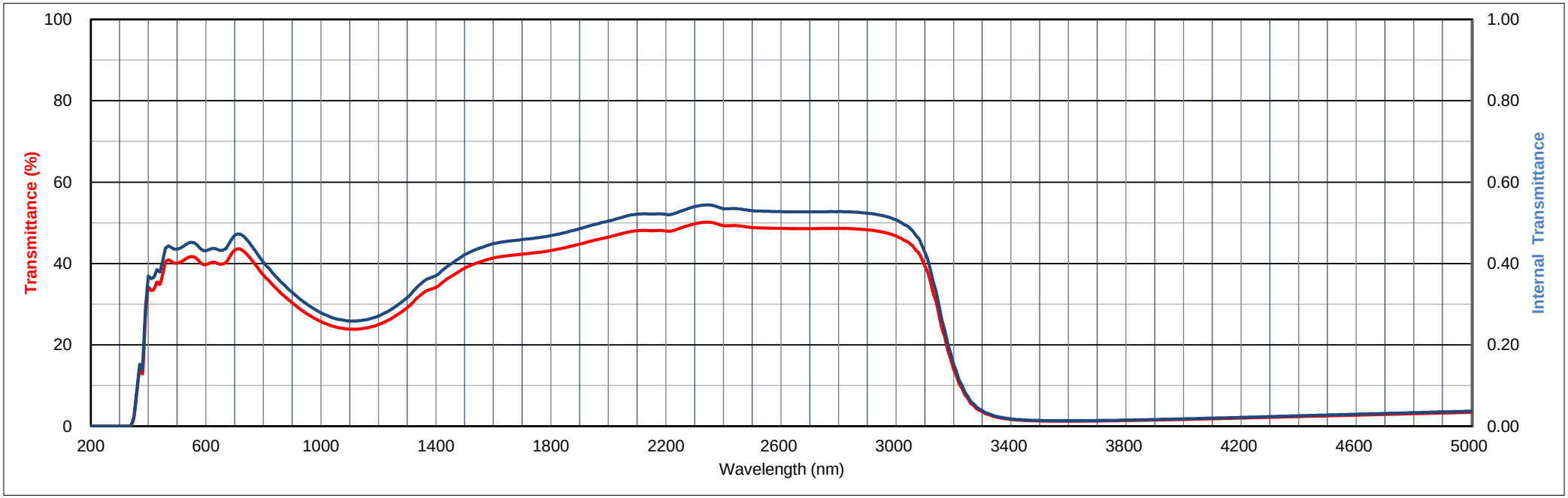
HOYA CORPORATION OPTICS SECTION

Thickness (2.73) mm

ND40

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.1	8.4	14.0	13.0	27.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	34.0	33.4	33.7	35.4	34.9	37.4	40.4	40.9	40.5	40.1	40.1	40.3	40.7	41.1	41.5	41.7	41.6	41.1	40.3	39.8
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	39.7	40.0	40.3	40.3	40.0	39.8	39.9	40.3	41.3	42.5	43.3	43.6	43.5	43.1	42.4	41.7	40.8	39.9	39.0	38.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	37.1	36.4	35.7	34.9	34.2	33.5	32.8	32.1	31.5	30.9	30.4	29.8	29.2	28.7	28.2	27.7	27.3	26.8	26.4	26.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	25.7	25.4	25.1	24.9	24.6	24.4	24.2	24.1	24.0	23.9	23.9	23.8	23.8	23.9	24.0	24.1	24.2	24.3	24.5	24.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	25.0	25.3	25.6	25.9	26.3	26.7	27.2	27.6	28.1	28.6	29.1	29.7	30.4	31.2	31.9	32.4	33.0	33.4	33.6	33.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	34.1	34.6	35.2	35.7	36.3	36.7	37.1	37.6	38.0	38.5	38.8	39.2	39.5	39.8	40.1	40.3	40.5	40.8	41.0	41.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	41.4	41.5	41.6	41.7	41.8	41.9	42.0	42.1	42.1	42.2	42.3	42.4	42.4	42.5	42.6	42.7	42.8	42.9	43.0	43.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	44.6	44.8	44.9	45.1	45.3	45.5	45.7	45.9	46.0	46.2	46.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	46.5	47.4	48.1	48.1	48.0	48.7	49.8	50.2	49.3	49.3	48.8	48.7	48.6	48.6	48.6	48.6	48.6	48.5	48.3	47.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	46.7	44.8	39.4	27.2	14.0	6.8	3.6	2.2	1.7	1.4	1.3	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.5	1.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.3
λnm	5000																			
T	3.4																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.5) mm

ND50

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	5.4	15.6	22.7	20.7	37.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	44.9	43.9	44.2	45.9	45.3	48.0	51.0	51.5	51.1	50.7	50.7	50.9	51.3	51.8	52.1	52.3	52.2	51.7	50.9	50.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	50.2	50.4	50.6	50.6	50.3	50.0	50.0	50.4	51.3	52.4	53.1	53.3	53.2	52.7	52.0	51.2	50.3	49.4	48.4	47.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	46.6	45.8	45.0	44.2	43.5	42.7	42.0	41.3	40.7	40.1	39.5	38.9	38.3	37.8	37.2	36.7	36.2	35.8	35.3	34.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	34.6	34.2	33.9	33.6	33.3	33.1	32.9	32.8	32.6	32.5	32.5	32.4	32.5	32.7	33.0	33.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.515	1.508	1.505	1.503	1.502	1.501	1.500
P	0.919	0.921	0.922	0.922	0.923	0.923	0.923

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

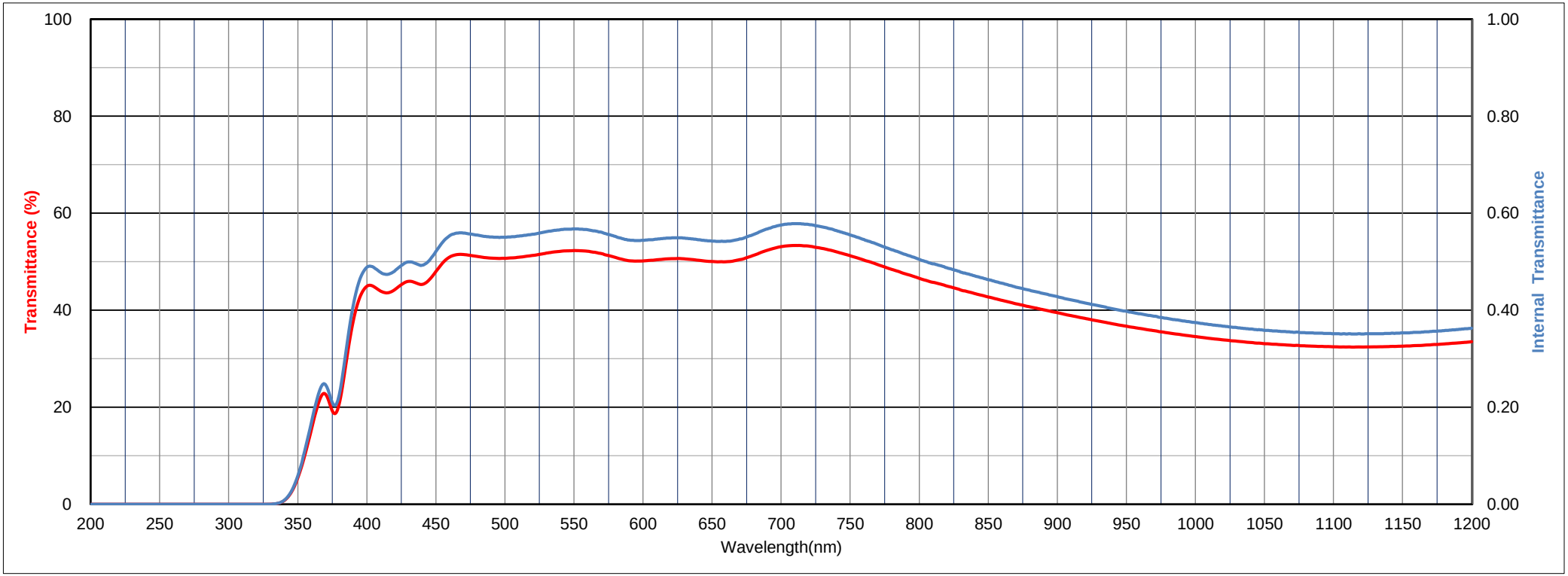
	x	y	Y	λ_d	P_e
A	0.448	0.412	51	571	3
C	0.312	0.325	51	562	3
D65	0.315	0.337	51	562	3

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	4	495	555	62	66	550	90	2.42

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
50±5	0.30±0.05



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HOYA

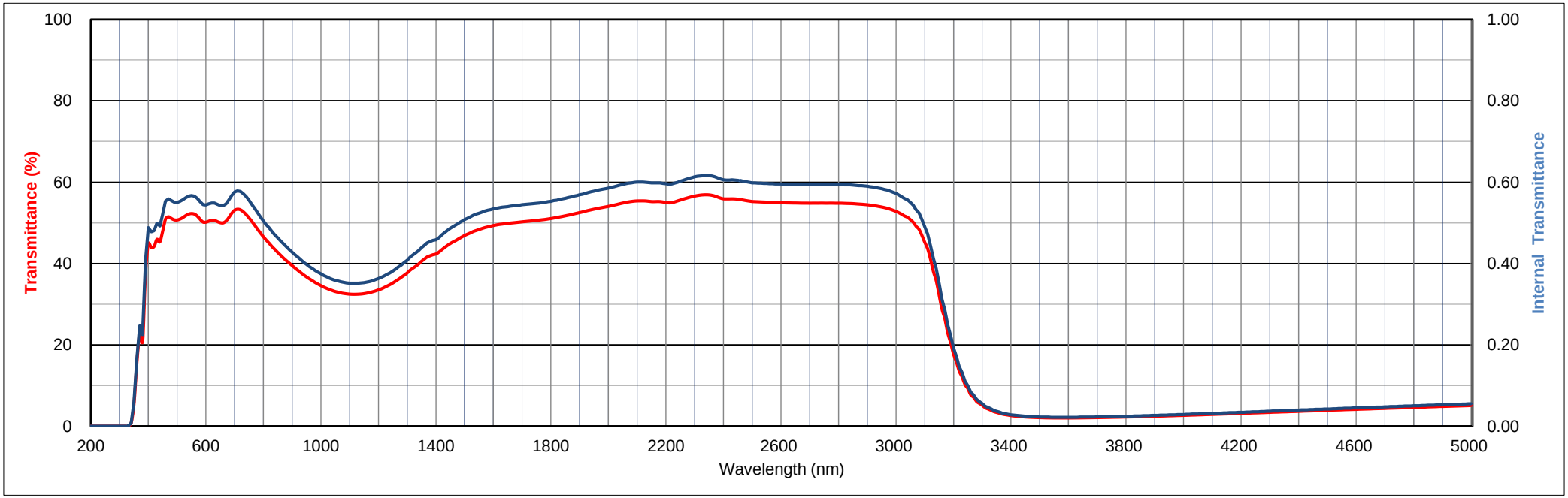
HOYA CORPORATION OPTICS SECTION

Transmittance (T) **units: %**

Thickness (2.5) mm

ND50

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	5.4	15.6	22.7	20.7	37.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	44.9	43.9	44.2	45.9	45.3	48.0	51.0	51.5	51.1	50.7	50.7	50.9	51.3	51.8	52.1	52.3	52.2	51.7	50.9	50.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	50.2	50.4	50.6	50.6	50.3	50.0	50.0	50.4	51.3	52.4	53.1	53.3	53.2	52.7	52.0	51.2	50.3	49.4	48.4	47.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	46.6	45.8	45.0	44.2	43.5	42.7	42.0	41.3	40.7	40.1	39.5	38.9	38.3	37.8	37.2	36.7	36.2	35.8	35.3	34.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	34.6	34.2	33.9	33.6	33.3	33.1	32.9	32.8	32.6	32.5	32.5	32.4	32.4	32.5	32.5	32.6	32.7	32.9	33.0	33.3
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	33.5	33.8	34.1	34.4	34.8	35.2	35.7	36.1	36.6	37.1	37.7	38.3	38.8	39.3	39.9	40.5	41.1	41.6	41.9	42.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	42.3	42.8	43.4	43.9	44.4	44.9	45.3	45.7	46.1	46.5	46.9	47.2	47.5	47.9	48.1	48.4	48.6	48.8	49.0	49.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	49.3	49.5	49.6	49.7	49.8	49.9	49.9	50.0	50.1	50.2	50.3	50.3	50.4	50.5	50.5	50.6	50.7	50.8	50.8	51.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	51.1	51.2	51.3	51.4	51.6	51.7	51.9	52.0	52.2	52.4	52.5	52.7	52.9	53.1	53.2	53.4	53.5	53.7	53.8	53.9
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	54.1	54.9	55.4	55.2	55.0	55.6	56.6	56.9	55.9	55.8	55.2	55.1	55.0	54.9	54.8	54.8	54.8	54.7	54.4	53.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	52.8	50.8	45.2	32.2	17.7	9.2	5.2	3.4	2.6	2.3	2.1	2.0	2.0	2.1	2.1	2.2	2.3	2.4	2.4	2.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.7	3.8	3.9	4.0	4.1	4.3	4.4	4.5	4.6	4.8	4.9	5.0
λnm	5000																			
T	5.1																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.75) mm

ND60

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.1	12.7	26.5	34.5	32.4	49.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	55.7	54.8	55.1	56.6	56.1	58.3	60.9	61.3	61.0	60.7	60.6	60.8	61.1	61.6	61.9	62.0	61.9	61.5	60.8	60.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	60.2	60.4	60.6	60.6	60.3	60.1	60.1	60.4	61.2	62.1	62.7	62.9	62.8	62.4	61.8	61.1	60.4	59.6	58.8	58.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	57.2	56.5	55.8	55.1	54.5	53.8	53.2	52.6	52.0	51.5	50.9	50.4	49.9	49.4	48.9	48.4	48.0	47.6	47.1	46.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	46.4	46.1	45.8	45.5	45.3	45.0	44.9	44.7	44.6	44.5	44.4	44.4	44.5	44.7	45.0	45.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.515	1.511	1.509	1.508	1.508	1.507	1.507
P	0.920	0.920	0.921	0.921	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

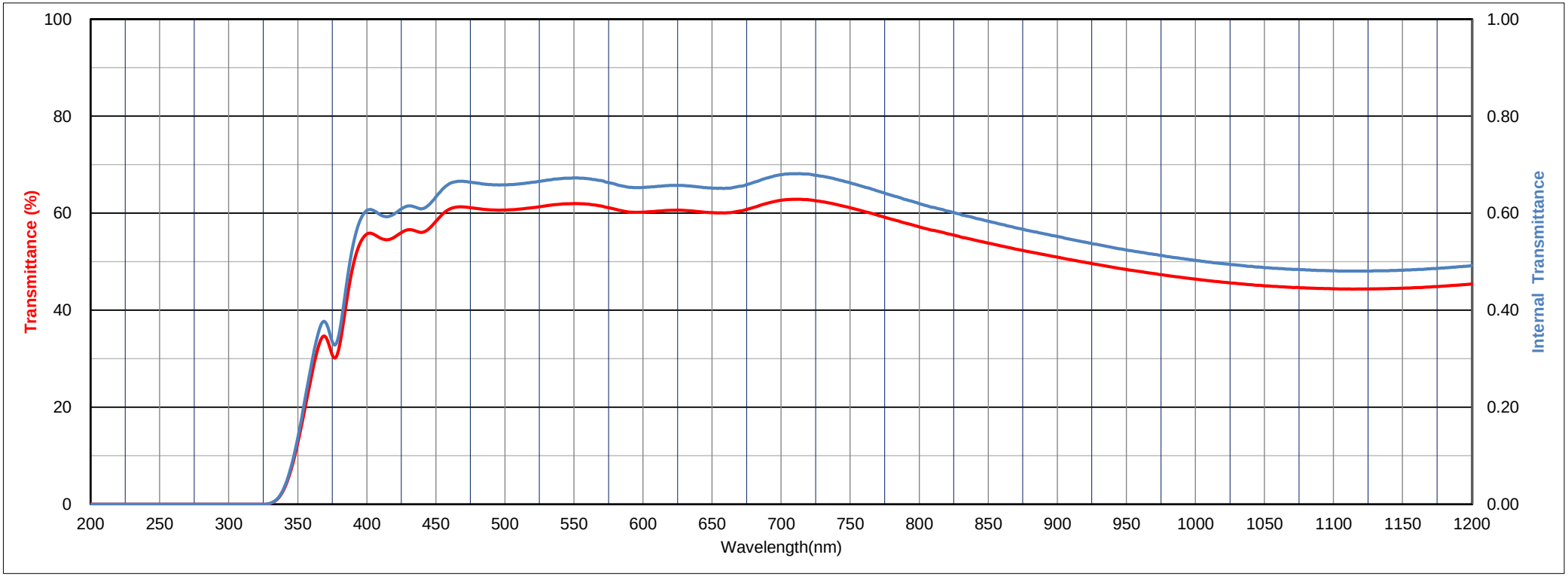
	x	y	Y	λ_d	P_e
A	0.448	0.411	61	571	2
C	0.312	0.322	61	562	2
D65	0.314	0.335	61	562	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
2	4	495	555	62	66	550	90	2.42

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
60±5	0.22±0.04



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HOYA

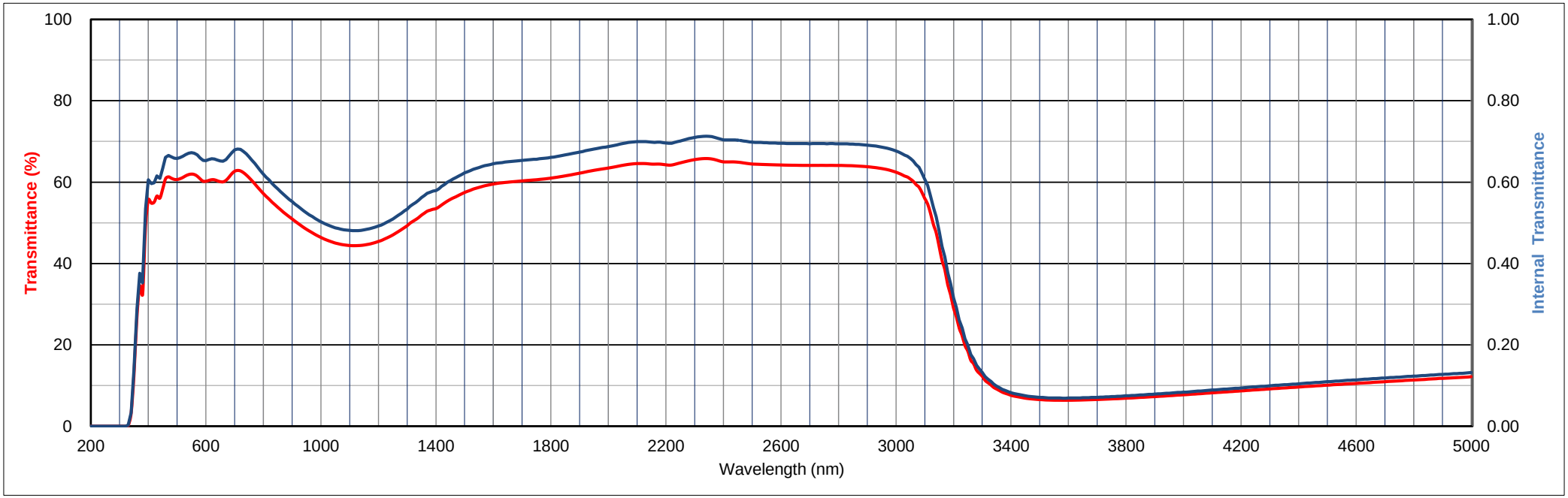
HOYA CORPORATION OPTICS SECTION

Thickness (1.75) mm

ND60

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.1	12.7	26.5	34.5	32.4	49.1
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	55.7	54.8	55.1	56.6	56.1	58.3	60.9	61.3	61.0	60.7	60.6	60.8	61.1	61.6	61.9	62.0	61.9	61.5	60.8	60.2
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	60.2	60.4	60.6	60.6	60.3	60.1	60.1	60.4	61.2	62.1	62.7	62.9	62.8	62.4	61.8	61.1	60.4	59.6	58.8	58.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	57.2	56.5	55.8	55.1	54.5	53.8	53.2	52.6	52.0	51.5	50.9	50.4	49.9	49.4	48.9	48.4	48.0	47.6	47.1	46.8
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	46.4	46.1	45.8	45.5	45.3	45.0	44.9	44.7	44.6	44.5	44.4	44.4	44.4	44.4	44.5	44.5	44.7	44.8	45.0	45.2
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	45.4	45.6	46.0	46.3	46.6	47.0	47.4	47.9	48.3	48.8	49.3	49.9	50.4	50.8	51.3	51.9	52.4	52.9	53.1	53.3
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	53.5	53.9	54.4	54.9	55.3	55.7	56.1	56.4	56.8	57.1	57.5	57.7	58.0	58.3	58.5	58.7	58.9	59.1	59.3	59.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	59.5	59.7	59.8	59.8	59.9	60.0	60.1	60.1	60.2	60.2	60.3	60.4	60.4	60.5	60.5	60.6	60.7	60.7	60.8	60.9
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	61.0	61.1	61.2	61.3	61.4	61.5	61.7	61.8	61.9	62.1	62.2	62.3	62.5	62.6	62.8	62.9	63.0	63.1	63.2	63.4
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	63.5	64.1	64.6	64.4	64.3	64.7	65.5	65.8	65.0	64.9	64.4	64.3	64.2	64.1	64.1	64.1	64.1	64.0	63.8	63.3
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	62.4	60.8	56.0	44.2	29.1	18.4	12.3	9.1	7.6	6.9	6.5	6.4	6.4	6.5	6.6	6.7	6.9	7.1	7.3	7.5
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	7.7	8.0	8.2	8.4	8.7	8.9	9.2	9.4	9.6	9.8	10.1	10.3	10.5	10.7	10.9	11.1	11.4	11.6	11.8	11.9
λnm	5000																			
T	12.2																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (2.9) mm

ND70

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.6	17.7	34.8	42.9	38.7	58.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	65.4	63.8	63.8	65.4	64.8	67.4	70.3	71.0	70.9	71.0	71.2	71.5	71.9	72.1	72.2	72.2	72.2	72.0	71.5	71.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	70.9	70.8	70.7	70.5	70.1	69.7	69.4	69.2	69.1	69.0	68.8	68.3	67.6	66.7	65.8	64.8	63.7	62.6	61.6	60.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	59.6	58.7	57.9	57.1	56.3	55.6	54.9	54.2	53.7	53.1	52.5	51.9	51.4	50.9	50.4	49.9	49.5	49.0	48.6	48.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	47.9	47.6	47.3	47.0	46.8	46.6	46.4	46.3	46.1	46.1	46.0	46.0	46.1	46.4	46.7	47.2				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.520	1.510	1.504	1.501	1.499	1.497	1.496
P	0.918	0.921	0.922	0.923	0.923	0.924	0.924

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

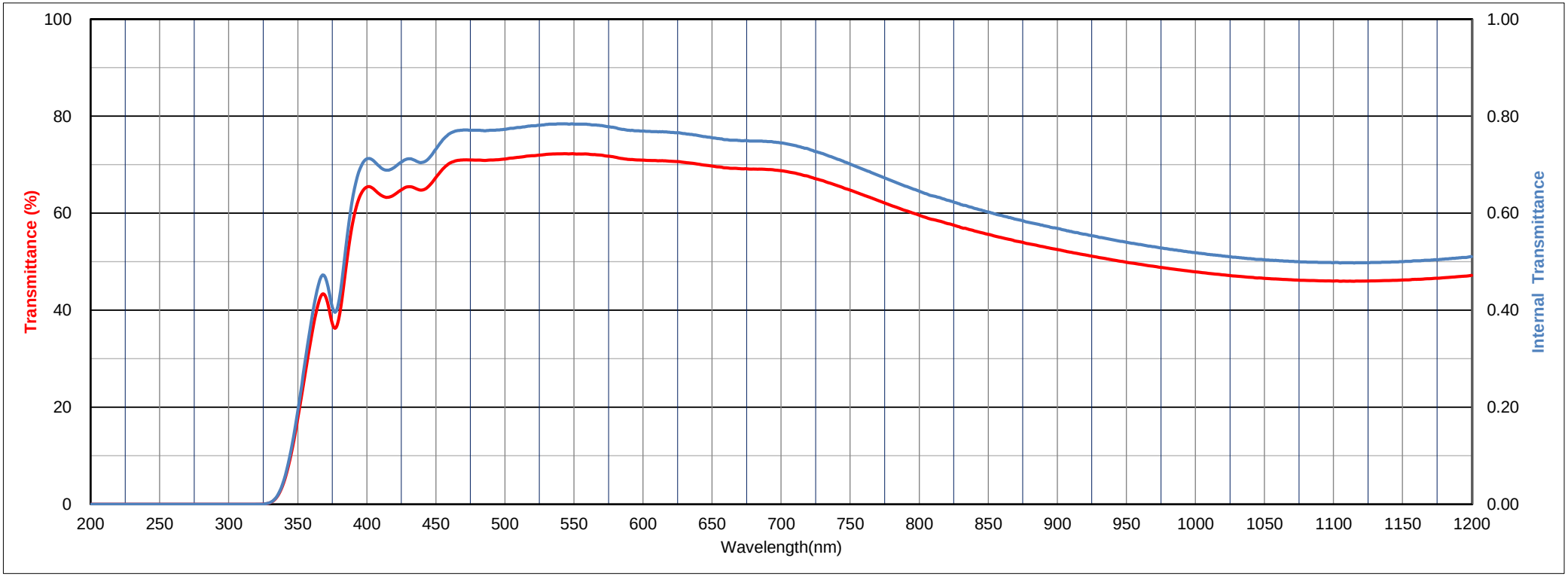
	x	y	Y	λ_d	P_e
A	0.448	0.411	71	572	3
C	0.312	0.324	72	564	3
D65	0.315	0.336	72	563	3

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	470	540	66	72	510	100	2.39

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
70±5	0.15±0.04



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HOYA

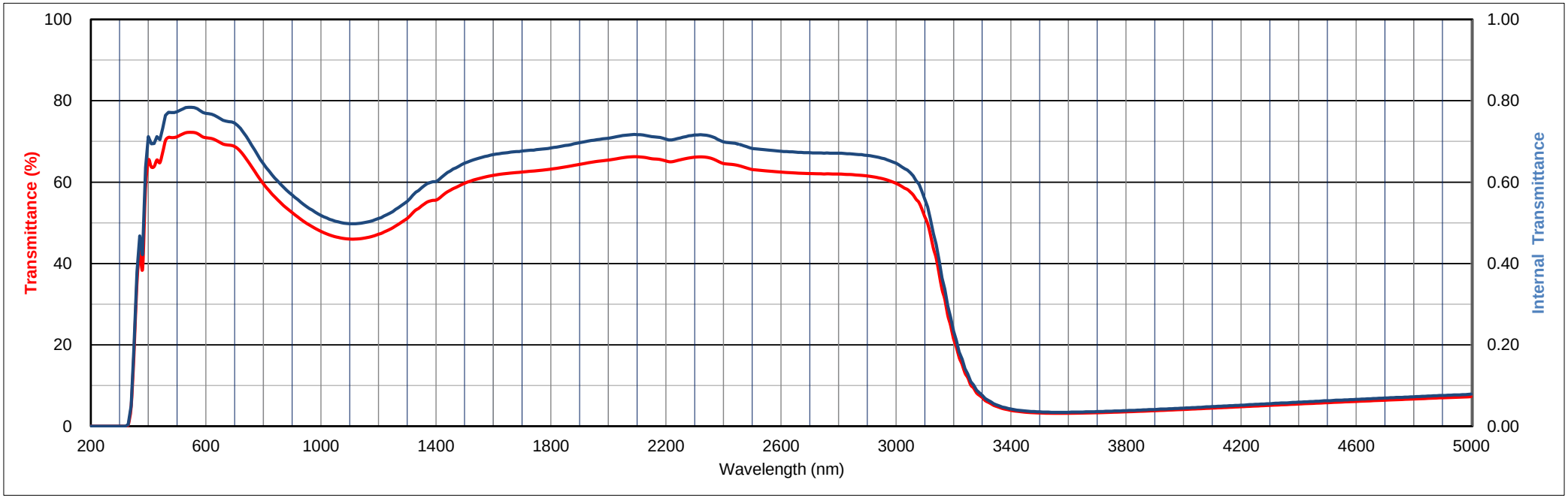
HOYA CORPORATION OPTICS SECTION

Thickness (2.9) mm

ND70

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.6	17.7	34.8	42.9	38.7	58.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	65.4	63.8	63.8	65.4	64.8	67.4	70.3	71.0	70.9	71.0	71.2	71.5	71.9	72.1	72.2	72.2	72.2	72.0	71.5	71.1
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	70.9	70.8	70.7	70.5	70.1	69.7	69.4	69.2	69.1	69.0	68.8	68.3	67.6	66.7	65.8	64.8	63.7	62.6	61.6	60.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	59.6	58.7	57.9	57.1	56.3	55.6	54.9	54.2	53.7	53.1	52.5	51.9	51.4	50.9	50.4	49.9	49.5	49.0	48.6	48.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	47.9	47.6	47.3	47.0	46.8	46.6	46.4	46.3	46.1	46.1	46.0	46.0	46.0	46.0	46.1	46.2	46.4	46.5	46.7	46.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	47.2	47.4	47.8	48.1	48.4	48.8	49.2	49.7	50.1	50.6	51.1	51.7	52.5	53.1	53.5	54.1	54.6	55.1	55.4	55.5
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	55.6	55.9	56.5	57.1	57.6	58.0	58.4	58.7	59.1	59.4	59.7	60.0	60.2	60.5	60.7	60.9	61.1	61.2	61.4	61.5
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	61.7	61.8	61.9	62.0	62.1	62.2	62.2	62.3	62.4	62.4	62.5	62.5	62.6	62.7	62.7	62.8	62.9	62.9	63.0	63.1
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	63.2	63.3	63.4	63.5	63.6	63.7	63.9	64.0	64.1	64.2	64.4	64.5	64.6	64.8	64.9	65.0	65.1	65.2	65.3	65.3
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	65.4	66.0	66.2	65.8	65.2	65.5	66.1	66.0	64.6	64.1	63.1	62.8	62.5	62.3	62.1	62.0	62.0	61.8	61.5	60.9
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	59.7	57.6	51.5	37.5	21.5	11.9	7.1	4.9	3.9	3.4	3.2	3.2	3.2	3.2	3.3	3.4	3.5	3.7	3.8	4.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	4.1	4.3	4.5	4.6	4.8	5.0	5.1	5.3	5.5	5.6	5.8	5.9	6.1	6.2	6.4	6.5	6.7	6.8	7.0	7.1
λnm	5000																			
T	7.3																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.5) mm

ND80

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.9	19.6	39.2	55.5	61.9	58.7	72.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	77.0	76.0	76.1	77.1	76.7	78.3	80.1	80.5	80.4	80.5	80.6	80.8	81.0	81.2	81.2	81.2	81.2	81.1	80.9	80.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	80.5	80.5	80.4	80.3	80.0	79.8	79.6	79.5	79.5	79.4	79.3	79.0	78.6	78.0	77.5	76.8	76.2	75.5	74.9	74.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	73.6	73.1	72.5	72.0	71.5	71.1	70.6	70.1	69.7	69.4	69.0	68.6	68.2	67.9	67.5	67.2	66.9	66.6	66.3	66.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	65.8	65.3	65.1	64.9	64.8	64.6	64.5	64.4	64.3	64.2	64.2	64.2	64.3	64.5	64.7	65.1				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.525	1.516	1.512	1.509	1.507	1.506	1.505
P	0.917	0.919	0.920	0.921	0.921	0.922	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

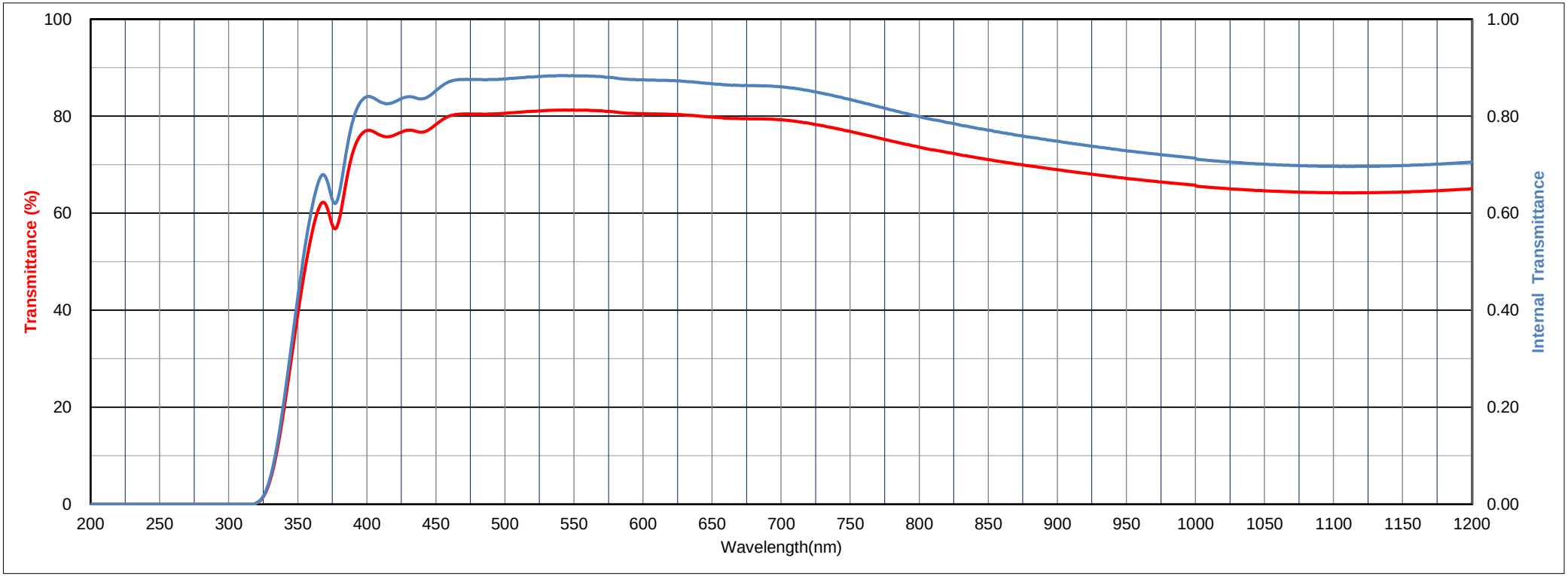
	x	y	Y	λ_d	P_e
A	0.448	0.409	81	573	2
C	0.311	0.320	81	564	1
D65	0.314	0.333	81	564	1

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	470	540	66	72	510	100	2.39

Tolerance of Transmittance (T)

Average Transmittance at 400nm-700nm	
Tav(%)	OD
80±5	0.1±0.03



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HOYA

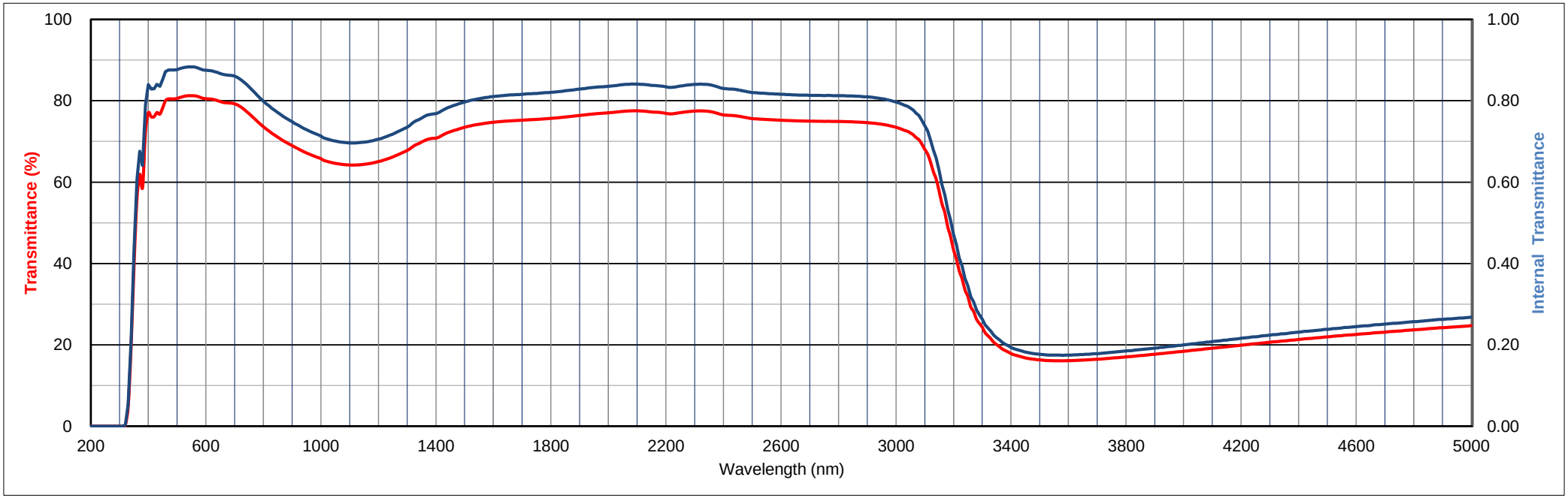
HOYA CORPORATION OPTICS SECTION

Thickness (1.5) mm

ND80

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.9	19.6	39.2	55.5	61.9	58.7	72.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	77.0	76.0	76.1	77.1	76.7	78.3	80.1	80.5	80.4	80.5	80.6	80.8	81.0	81.2	81.2	81.2	81.2	81.1	80.9	80.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	80.5	80.5	80.4	80.3	80.0	79.8	79.6	79.5	79.5	79.4	79.3	79.0	78.6	78.0	77.5	76.8	76.2	75.5	74.9	74.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	73.6	73.1	72.5	72.0	71.5	71.1	70.6	70.1	69.7	69.4	69.0	68.6	68.2	67.9	67.5	67.2	66.9	66.6	66.3	66.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	65.8	65.3	65.1	64.9	64.8	64.6	64.5	64.4	64.3	64.2	64.2	64.2	64.2	64.2	64.3	64.4	64.5	64.6	64.7	64.9
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	65.1	65.2	65.5	65.7	65.9	66.2	66.5	66.8	67.1	67.4	67.8	68.2	68.7	69.2	69.5	69.9	70.2	70.5	70.7	70.8
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	70.8	71.0	71.4	71.8	72.1	72.4	72.6	72.8	73.1	73.3	73.5	73.7	73.8	74.0	74.1	74.2	74.3	74.5	74.6	74.6
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	74.7	74.8	74.9	74.9	75.0	75.0	75.1	75.1	75.1	75.2	75.2	75.3	75.3	75.4	75.4	75.4	75.5	75.5	75.6	75.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	75.7	75.7	75.8	75.9	75.9	76.0	76.1	76.2	76.2	76.3	76.4	76.5	76.5	76.6	76.7	76.8	76.8	76.9	76.9	77.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	77.0	77.4	77.5	77.2	76.9	77.1	77.5	77.4	76.5	76.2	75.6	75.4	75.2	75.1	75.0	74.9	74.9	74.8	74.6	74.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	73.5	72.1	68.1	57.8	43.4	31.9	24.3	20.1	17.8	16.8	16.3	16.1	16.1	16.3	16.4	16.7	17.0	17.4	17.7	18.1
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	18.4	18.8	19.2	19.5	19.9	20.3	20.6	21.0	21.3	21.6	22.0	22.3	22.5	22.8	23.1	23.4	23.7	24.0	24.2	24.4
λnm	5000																			
T	24.7																			



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Neutral Density Filters (W-ND series)

World standard Neutral density filters (W-ND filters) with top quality and excellent optical performance. W-ND series is designed to match the world standard and different from current line of neutral density glass types in terms of thickness and transmittance.

Neutral density filters can be used for various purposes including adjustment of light amount as the light intensity can be controlled without selectively absorbing light with a specific wavelength (405nm, 546nm and 694nm).

Neutral Density Product Portfolio:

	HOYA W-ND series	HOYA ND series
Standard Thickness	t1.0mm*	t2.5mm*
Transmittance	Specified at 405nm, 546nm, 694nm	Average 400-700nm
	Internal Transmittance	External Transmittance

*Optical characteristics of W-ND/ND series filters are always made by adjusting thickness of the glass.

“W-ND” Series Specification:

W-ND Series of absorption type Neutral Density Filters are widely available with specific OD or transmittance values. They are able to achieve the expansive offering by adjusting thickness based on the characteristics of the mother glass. Neutral Density Filter types make it possible to provide particularly high density filters. The table below reflects the W-ND filter series options by OD value and typical thickness.

Transmission (%) @546nm	Optical Density @546nm	Standard Thickness (mm) *reference	Mother Glass
50	0.3	2.3	W-ND11
25	0.6	2.3	W-ND5
10	1.0	1.7	W-ND4
5	1.3	2.3	W-ND4
1	2.0	2.0	W-ND3
0.1	3.0	2.1	W-ND9
0.01	4.0	2.8	W-ND9
0.001	5.0	3.5	W-ND9

*All data is mean values of various melts.

*Optical characteristics of W-ND/ND series filters are always made by adjusting thickness of the glass.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness （1.00） mm

W-ND9

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.001	0.004	0.006	0.014
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.021	0.025	0.028	0.031	0.032	0.035	0.039	0.039	0.038	0.037	0.036	0.036	0.036	0.037	0.038	0.038	0.037	0.037	0.036	0.037
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.038	0.040	0.041	0.043	0.045	0.048	0.051	0.056	0.063	0.071	0.078	0.084	0.089	0.093	0.097	0.100	0.102	0.104	0.106	0.108
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.109	0.108	0.110	0.110	0.110	0.110	0.109	0.109	0.107	0.106	0.104	0.104	0.103	0.102	0.101	0.100	0.100	0.099	0.099	0.099
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.099	0.099	0.100	0.100	0.101	0.102	0.103	0.104	0.105	0.106	0.108	0.111	0.116	0.121	0.127	0.133				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.539	1.527	1.521	1.517	1.514	1.513	1.512
P	0.914	0.917	0.918	0.919	0.920	0.920	0.920

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

	x	y	Y	λ_d	P_e
A	0.463	0.404	4	602	8
C	0.323	0.324	3	585	6
D65	0.326	0.336	3	585	6

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	490	545	-	78	415	109	2.46

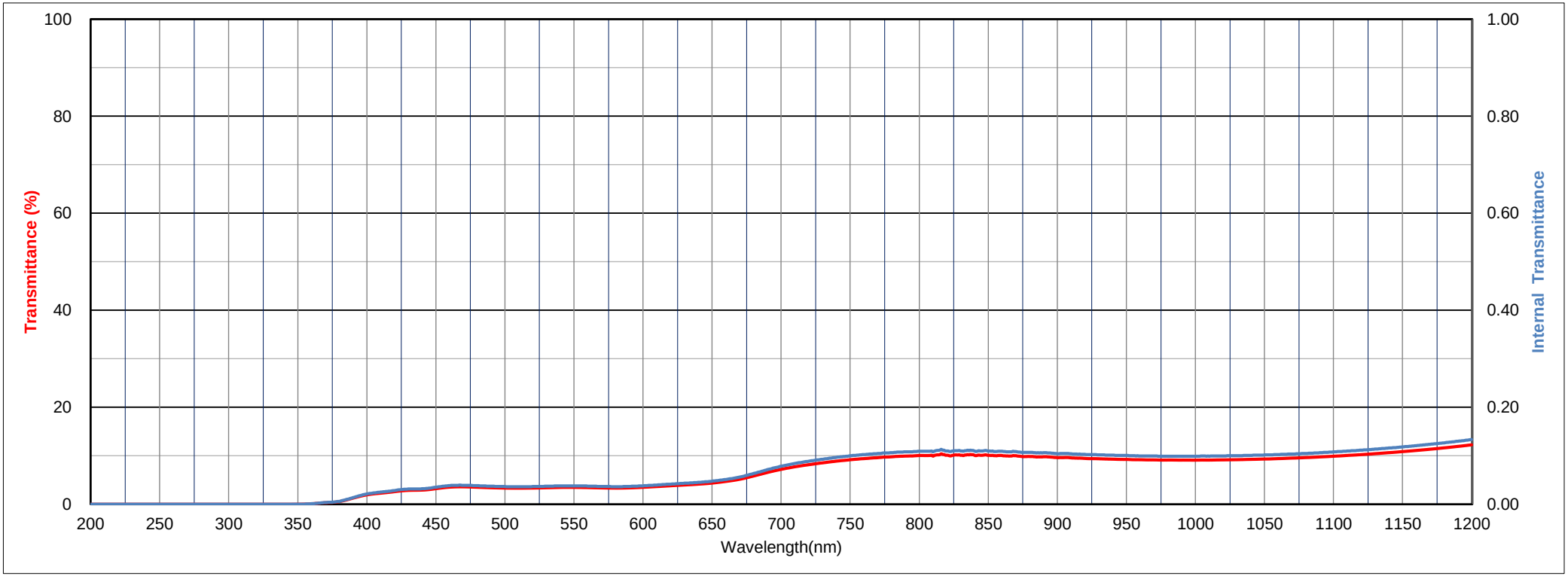
Tolerance of Transmittance (τ)

τ 405 (1)	τ 546 (2)	τ 694 (3)
0.025±0.01	0.04±0.02	0.08±0.02

(1)Internal transmittance at 405nm

(2)Internal transmittance at 546nm

(3)Internal transmittance at 694nm



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The content of this catalog is accurate as of October ,2020

HOYA

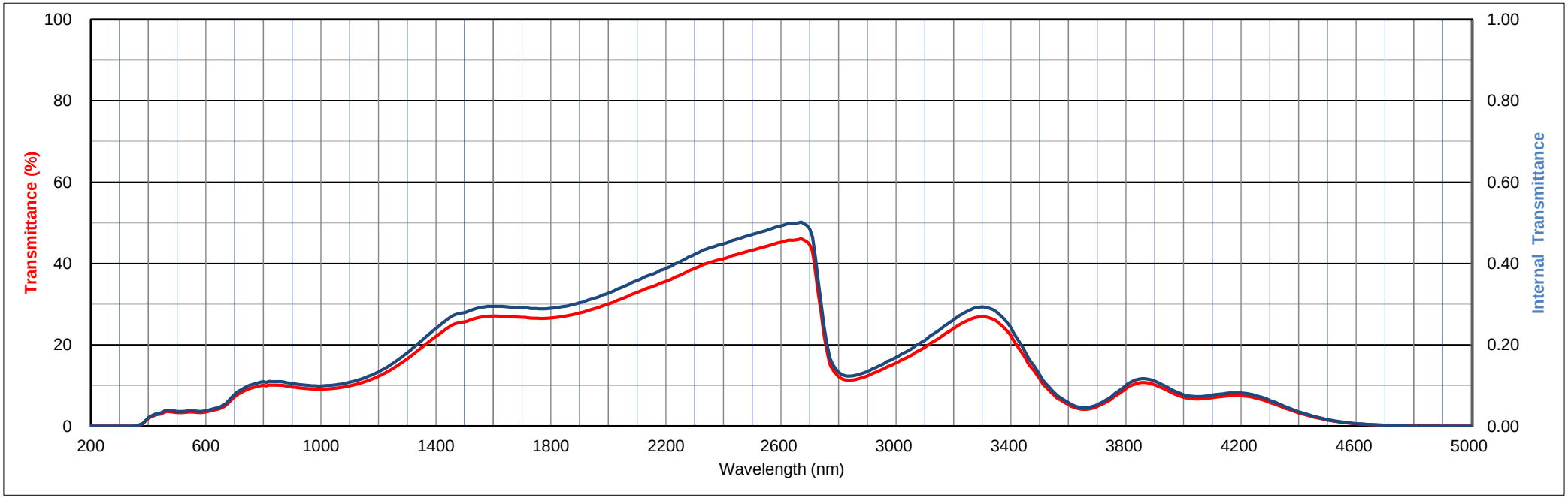
HOYA CORPORATION OPTICS SECTION

Thickness (1.00) mm

W-ND9

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.001	0.004	0.006	0.014
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.021	0.025	0.028	0.031	0.032	0.035	0.039	0.039	0.038	0.037	0.036	0.036	0.036	0.037	0.038	0.038	0.037	0.037	0.036	0.037
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.038	0.040	0.041	0.043	0.045	0.048	0.051	0.056	0.063	0.071	0.078	0.084	0.089	0.093	0.097	0.100	0.102	0.104	0.106	0.108
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.109	0.108	0.110	0.110	0.110	0.110	0.109	0.109	0.107	0.106	0.104	0.104	0.103	0.102	0.101	0.100	0.100	0.099	0.099	0.099
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.099	0.099	0.100	0.100	0.101	0.102	0.103	0.104	0.105	0.106	0.108	0.110	0.111	0.114	0.116	0.118	0.121	0.124	0.127	0.130
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.133	0.137	0.141	0.145	0.150	0.154	0.159	0.164	0.169	0.175	0.180	0.186	0.192	0.198	0.204	0.210	0.216	0.222	0.228	0.234
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.240	0.246	0.251	0.257	0.262	0.268	0.272	0.275	0.277	0.278	0.279	0.281	0.284	0.287	0.289	0.291	0.292	0.293	0.294	0.295
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.295	0.295	0.295	0.294	0.294	0.293	0.292	0.292	0.292	0.292	0.291	0.291	0.290	0.289	0.289	0.289	0.288	0.288	0.289	0.289
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.290	0.290	0.291	0.292	0.294	0.295	0.296	0.298	0.299	0.301	0.303	0.305	0.307	0.310	0.312	0.314	0.316	0.319	0.322	0.325
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.327	0.342	0.358	0.373	0.388	0.404	0.422	0.438	0.448	0.460	0.471	0.482	0.492	0.499	0.485	0.243	0.133	0.124	0.134	0.151
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.169	0.188	0.211	0.236	0.261	0.283	0.293	0.281	0.242	0.183	0.127	0.083	0.058	0.045	0.053	0.073	0.100	0.116	0.111	0.093
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.077	0.073	0.076	0.081	0.081	0.075	0.063	0.049	0.035	0.025	0.016	0.010	0.006	0.004	0.002	0.001	0.001	0.001	0.001	0.001
λnm	5000																			
τ	<1E-05																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.00) mm

W-ND3

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.002	0.008	0.019	0.027	0.050
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.068	0.075	0.081	0.087	0.087	0.093	0.100	0.100	0.097	0.094	0.093	0.092	0.092	0.094	0.096	0.096	0.094	0.092	0.090	0.091
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.093	0.096	0.099	0.102	0.104	0.108	0.114	0.122	0.135	0.149	0.160	0.168	0.175	0.179	0.184	0.187	0.189	0.191	0.192	0.192
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.193	0.191	0.193	0.191	0.190	0.187	0.185	0.182	0.180	0.178	0.176	0.174	0.171	0.169	0.167	0.166	0.164	0.163	0.162	0.162
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.161	0.161	0.161	0.161	0.161	0.162	0.162	0.163	0.164	0.166	0.167	0.171	0.175	0.181	0.187	0.195				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.537	1.523	1.516	1.512	1.509	1.507	1.506
P	0.914	0.918	0.919	0.920	0.921	0.921	0.922

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

	x	y	Y	λ_d	P_e
A	0.454	0.404	9	638	3
C	0.315	0.318	9	593	2
D65	0.317	0.330	9	593	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	485	545	-	75	416	114	2.44

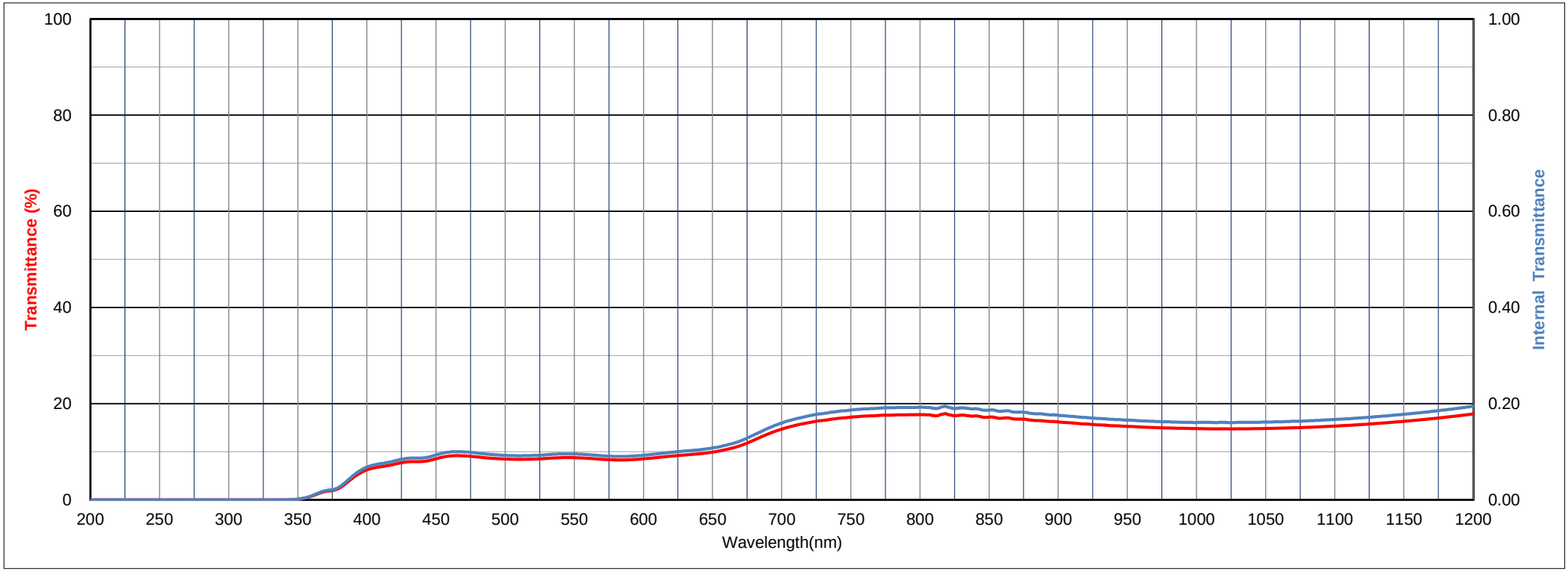
Tolerance of Transmittance (τ)

τ 405 (1)	τ 546 (2)	τ 694 (3)
0.06±0.02	0.10±0.02	0.17±0.03

(1)Internal transmittance at 405nm

(2)Internal transmittance at 546nm

(3)Internal transmittance at 694nm



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HOYA

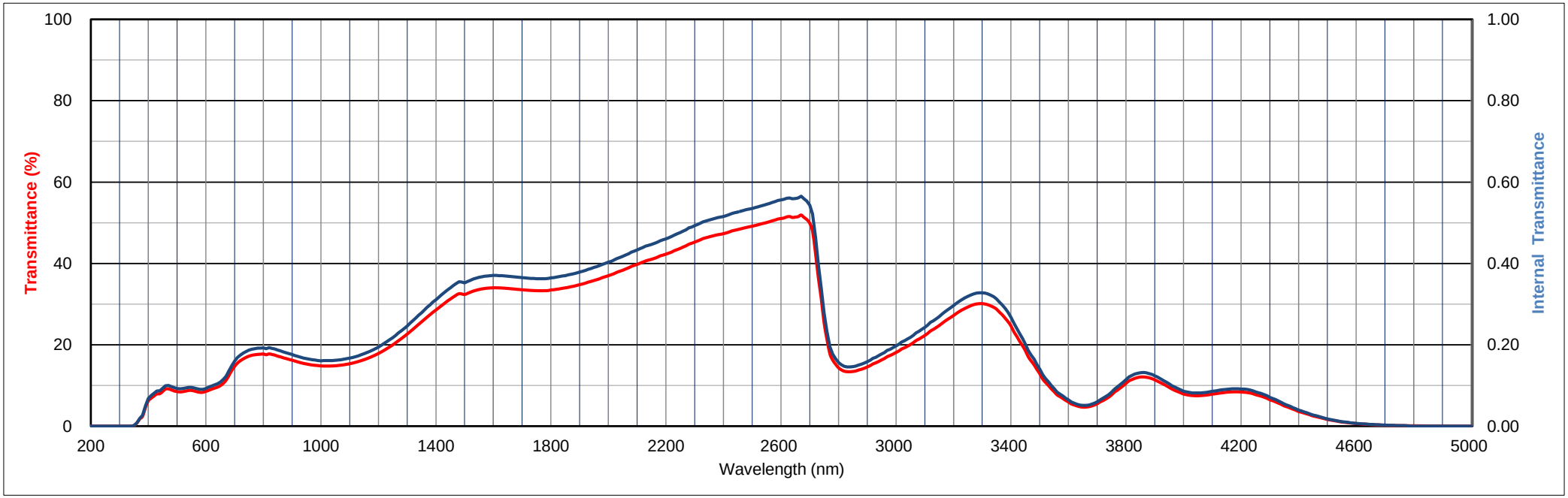
HOYA CORPORATION OPTICS SECTION

Thickness （1.00） mm

W-ND3

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.002	0.008	0.019	0.027	0.050
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.068	0.075	0.081	0.087	0.087	0.093	0.100	0.100	0.097	0.094	0.093	0.092	0.092	0.094	0.096	0.096	0.094	0.092	0.090	0.091
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.093	0.096	0.099	0.102	0.104	0.108	0.114	0.122	0.135	0.149	0.160	0.168	0.175	0.179	0.184	0.187	0.189	0.191	0.192	0.192
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.193	0.191	0.193	0.191	0.190	0.187	0.185	0.182	0.180	0.178	0.176	0.174	0.171	0.169	0.167	0.166	0.164	0.163	0.162	0.162
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.161	0.161	0.161	0.161	0.161	0.162	0.162	0.163	0.164	0.166	0.167	0.169	0.171	0.173	0.175	0.178	0.181	0.184	0.187	0.191
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.195	0.199	0.203	0.208	0.213	0.218	0.223	0.229	0.234	0.240	0.246	0.253	0.259	0.266	0.273	0.279	0.286	0.292	0.299	0.305
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.311	0.317	0.323	0.329	0.335	0.340	0.345	0.350	0.355	0.354	0.353	0.356	0.359	0.362	0.364	0.366	0.367	0.369	0.370	0.370
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.370	0.370	0.370	0.370	0.369	0.369	0.368	0.367	0.367	0.366	0.365	0.365	0.364	0.363	0.363	0.363	0.363	0.363	0.363	0.363
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.365	0.365	0.367	0.368	0.369	0.370	0.372	0.373	0.375	0.377	0.379	0.381	0.383	0.386	0.388	0.390	0.392	0.395	0.398	0.400
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.403	0.418	0.433	0.447	0.461	0.476	0.493	0.507	0.515	0.526	0.535	0.545	0.556	0.560	0.543	0.277	0.156	0.146	0.159	0.177
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.197	0.218	0.243	0.269	0.296	0.319	0.328	0.313	0.268	0.202	0.141	0.092	0.065	0.051	0.060	0.084	0.115	0.132	0.124	0.104
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.086	0.081	0.086	0.091	0.091	0.084	0.071	0.054	0.039	0.027	0.018	0.011	0.007	0.004	0.002	0.001	0.001	0.001	0.001	0.001
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.00) mm

W-ND4

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.008	0.038	0.093	0.139	0.157	0.228
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.267	0.275	0.282	0.291	0.290	0.300	0.310	0.307	0.300	0.293	0.287	0.285	0.287	0.291	0.295	0.294	0.289	0.282	0.275	0.274
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.276	0.281	0.284	0.287	0.288	0.291	0.300	0.312	0.334	0.356	0.371	0.381	0.386	0.388	0.389	0.388	0.385	0.382	0.378	0.373
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.369	0.364	0.359	0.354	0.349	0.343	0.337	0.333	0.327	0.322	0.316	0.311	0.306	0.302	0.298	0.294	0.290	0.287	0.284	0.282
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.279	0.279	0.277	0.276	0.275	0.275	0.274	0.274	0.274	0.275	0.276	0.278	0.282	0.287	0.293	0.301				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.529	1.515	1.508	1.504	1.501	1.499	1.498
P	0.916	0.919	0.921	0.922	0.923	0.923	0.924

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

	x	y	Y	λ_d	P_e
A	0.445	0.405	26	483	1
C	0.306	0.312	26	479	2
D65	0.308	0.325	26	480	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	490	555	-	70	417	111	2.42

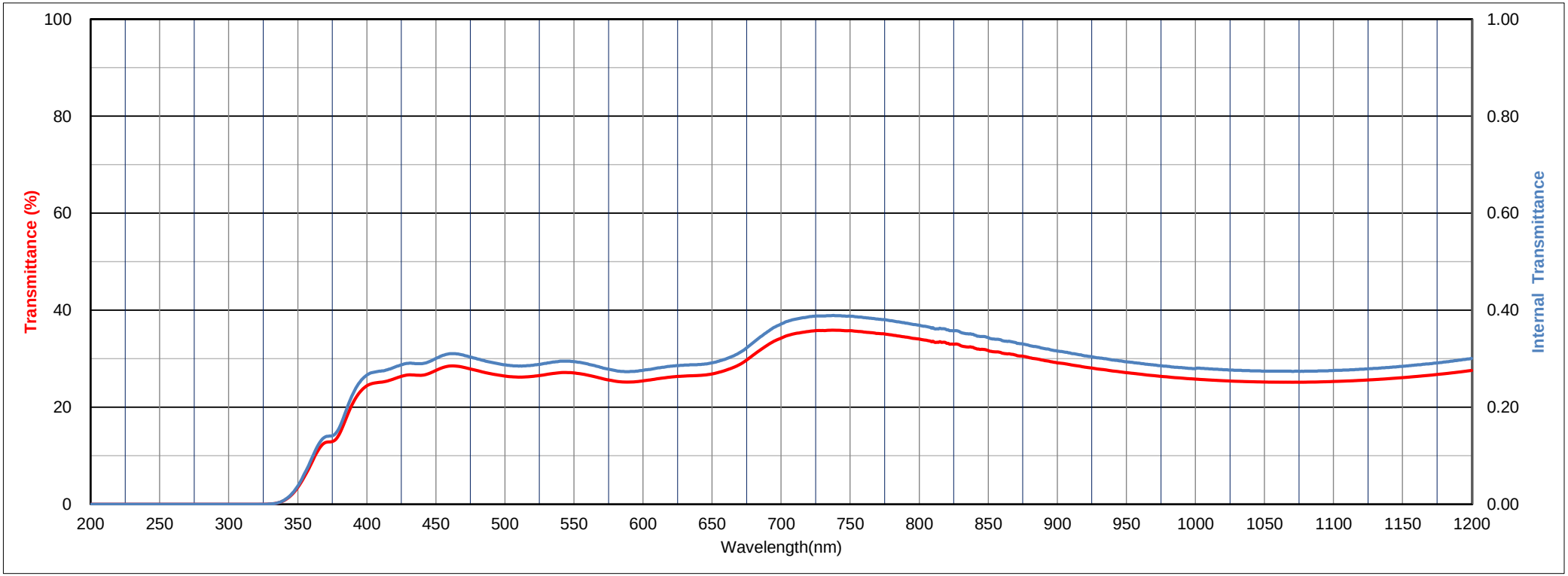
Tolerance of Transmittance (τ)

τ 405 (1)	τ 546 (2)	τ 694 (3)
0.27±0.03	0.31±0.03	0.39±0.04

(1)Internal transmittance at 405nm

(2)Internal transmittance at 546nm

(3)Internal transmittance at 694nm



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HOYA

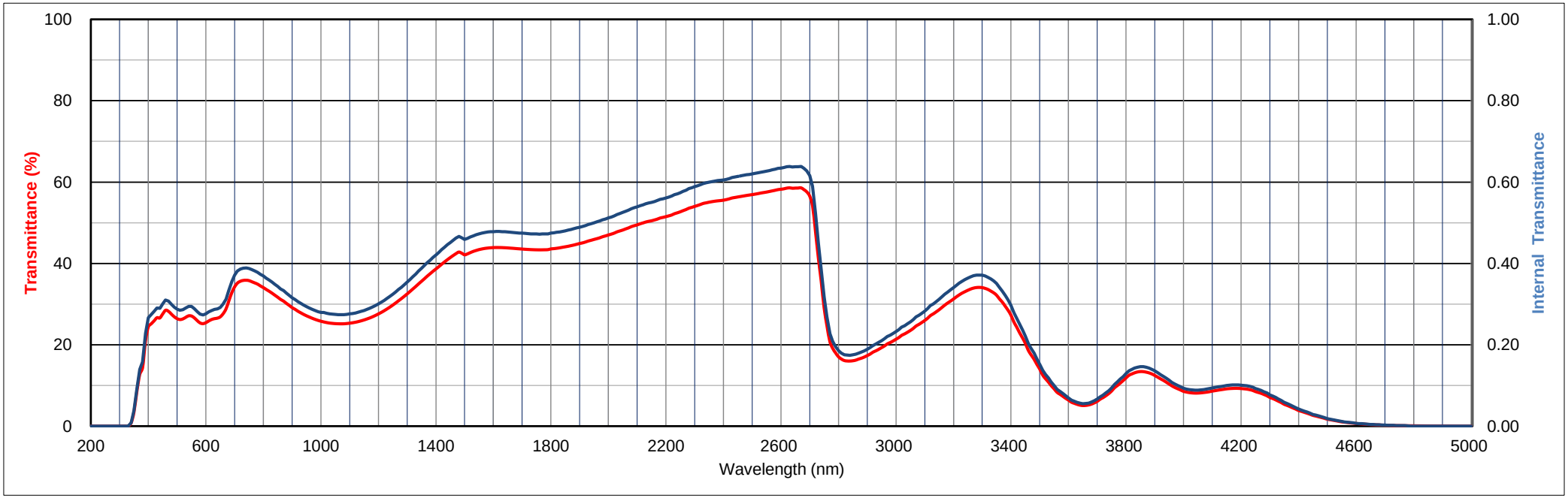
HOYA CORPORATION OPTICS SECTION

Thickness （1.00） mm

W-ND4

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.008	0.038	0.093	0.139	0.157	0.228
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.267	0.275	0.282	0.291	0.290	0.300	0.310	0.307	0.300	0.293	0.287	0.285	0.287	0.291	0.295	0.294	0.289	0.282	0.275	0.274
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.276	0.281	0.284	0.287	0.288	0.291	0.300	0.312	0.334	0.356	0.371	0.381	0.386	0.388	0.389	0.388	0.385	0.382	0.378	0.373
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.369	0.364	0.359	0.354	0.349	0.343	0.337	0.333	0.327	0.322	0.316	0.311	0.306	0.302	0.298	0.294	0.290	0.287	0.284	0.282
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.279	0.279	0.277	0.276	0.275	0.275	0.274	0.274	0.274	0.275	0.276	0.277	0.278	0.280	0.282	0.284	0.287	0.290	0.293	0.297
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.301	0.305	0.309	0.314	0.319	0.324	0.330	0.336	0.342	0.348	0.354	0.361	0.368	0.374	0.381	0.388	0.395	0.402	0.408	0.415
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.421	0.427	0.434	0.440	0.446	0.452	0.457	0.462	0.466	0.463	0.459	0.461	0.465	0.468	0.471	0.473	0.475	0.476	0.477	0.478
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.478	0.478	0.478	0.478	0.478	0.477	0.477	0.476	0.476	0.475	0.474	0.474	0.473	0.473	0.473	0.472	0.472	0.472	0.472	0.473
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.475	0.475	0.476	0.478	0.479	0.480	0.482	0.483	0.485	0.487	0.489	0.491	0.493	0.496	0.498	0.500	0.502	0.505	0.507	0.510
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.512	0.525	0.539	0.550	0.561	0.574	0.589	0.600	0.605	0.614	0.620	0.627	0.635	0.638	0.616	0.317	0.186	0.175	0.189	0.210
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.233	0.256	0.283	0.312	0.341	0.364	0.371	0.351	0.297	0.222	0.153	0.100	0.070	0.055	0.066	0.094	0.129	0.146	0.136	0.113
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.093	0.089	0.094	0.100	0.101	0.093	0.077	0.059	0.042	0.029	0.019	0.011	0.007	0.004	0.002	0.001	0.001	0.001	0.001	0.001
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness （1.00） mm

W-ND5

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.015	0.080	0.200	0.330	0.395	0.404	0.514
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.558	0.558	0.562	0.571	0.569	0.582	0.595	0.594	0.588	0.582	0.579	0.577	0.580	0.584	0.588	0.587	0.583	0.575	0.568	0.567
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.568	0.571	0.573	0.574	0.574	0.575	0.580	0.591	0.607	0.623	0.634	0.640	0.640	0.639	0.637	0.632	0.627	0.621	0.615	0.609
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.604	0.597	0.591	0.583	0.575	0.569	0.563	0.556	0.550	0.544	0.538	0.531	0.525	0.520	0.515	0.511	0.506	0.502	0.499	0.495
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.492	0.493	0.491	0.489	0.487	0.486	0.485	0.484	0.484	0.484	0.484	0.486	0.489	0.493	0.498	0.505				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.527	1.513	1.506	1.502	1.499	1.497	1.495
P	0.917	0.920	0.922	0.923	0.923	0.924	0.924

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

	x	y	Y	λ_d	P_e
A	0.446	0.408	53	500	0
C	0.309	0.317	53	494	0
D65	0.311	0.329	53	495	0

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	490	560	-	68	416	124	2.42

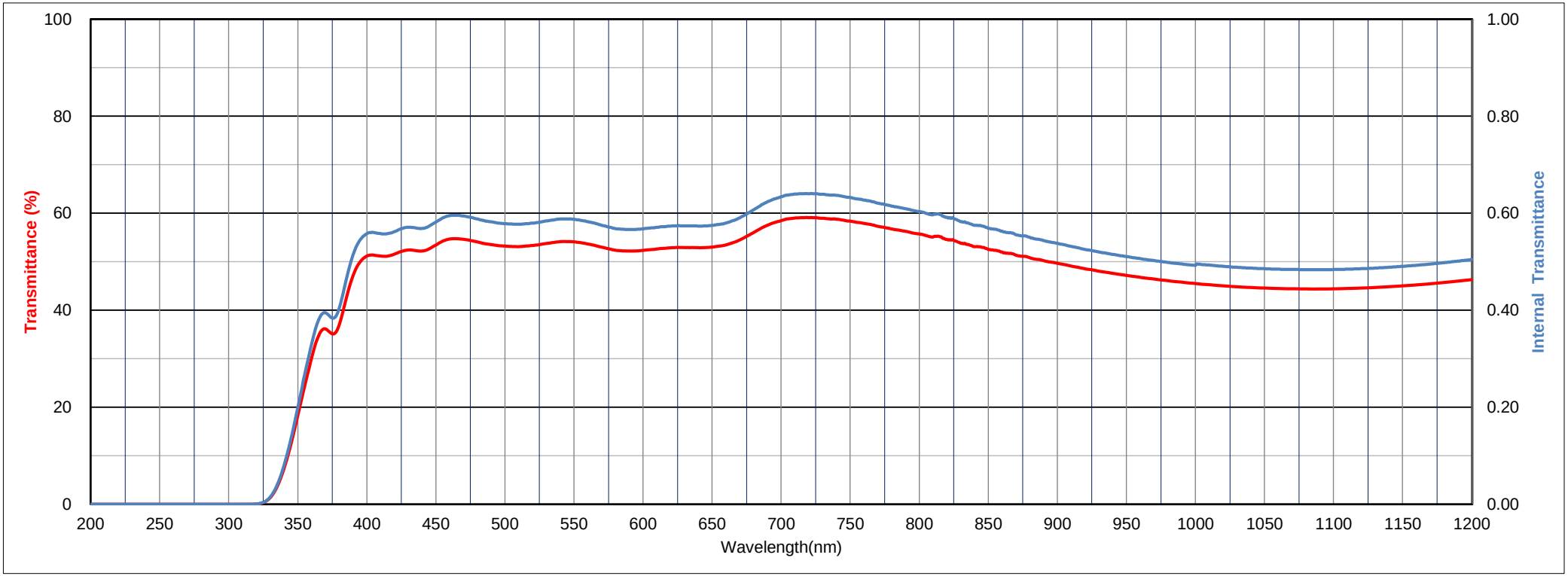
Tolerance of Transmittance (τ)

τ 405 (1)	τ 546 (2)	τ 694 (3)
0.56±0.03	0.57±0.03	0.62±0.03

(1)Internal transmittance at 405nm

(2)Internal transmittance at 546nm

(3)Internal transmittance at 694nm



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HOYA

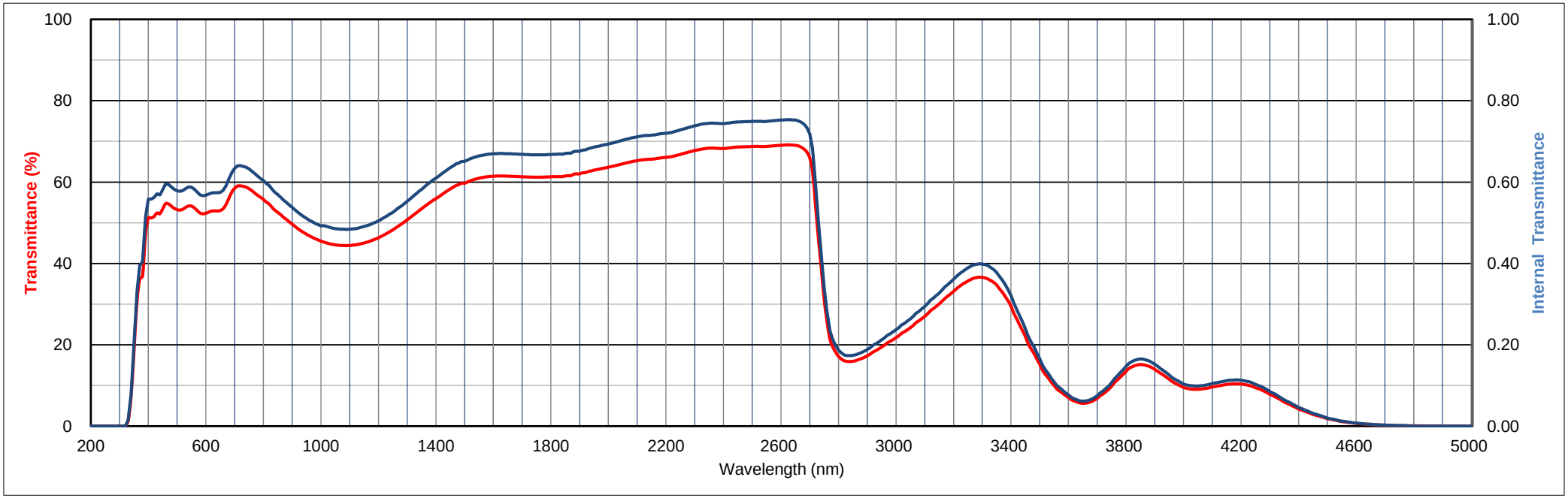
HOYA CORPORATION OPTICS SECTION

Thickness （1.00） mm

W-ND5

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.015	0.080	0.200	0.330	0.395	0.404	0.514
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.558	0.558	0.562	0.571	0.569	0.582	0.595	0.594	0.588	0.582	0.579	0.577	0.580	0.584	0.588	0.587	0.583	0.575	0.568	0.567
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.568	0.571	0.573	0.574	0.574	0.575	0.580	0.591	0.607	0.623	0.634	0.640	0.640	0.639	0.637	0.632	0.627	0.621	0.615	0.609
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.604	0.597	0.591	0.583	0.575	0.569	0.563	0.556	0.550	0.544	0.538	0.531	0.525	0.520	0.515	0.511	0.506	0.502	0.499	0.495
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.492	0.493	0.491	0.489	0.487	0.486	0.485	0.484	0.484	0.484	0.484	0.485	0.486	0.487	0.489	0.491	0.493	0.495	0.498	0.501
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.505	0.508	0.512	0.517	0.521	0.526	0.531	0.536	0.541	0.547	0.553	0.559	0.564	0.570	0.576	0.582	0.588	0.594	0.600	0.605
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.610	0.615	0.620	0.625	0.631	0.635	0.640	0.645	0.647	0.651	0.651	0.654	0.657	0.660	0.662	0.664	0.666	0.667	0.668	0.669
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.670	0.670	0.670	0.670	0.670	0.670	0.669	0.669	0.669	0.668	0.668	0.668	0.667	0.667	0.667	0.667	0.667	0.667	0.667	0.668
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.668	0.669	0.668	0.669	0.668	0.670	0.671	0.671	0.675	0.676	0.676	0.679	0.679	0.682	0.684	0.686	0.687	0.689	0.691	0.692
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.694	0.703	0.711	0.715	0.720	0.728	0.738	0.745	0.744	0.748	0.749	0.749	0.752	0.752	0.719	0.341	0.187	0.174	0.188	0.212
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.237	0.264	0.294	0.327	0.361	0.389	0.399	0.378	0.321	0.240	0.166	0.109	0.077	0.061	0.075	0.107	0.147	0.165	0.152	0.126
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.104	0.099	0.105	0.112	0.113	0.103	0.085	0.064	0.046	0.031	0.020	0.012	0.008	0.004	0.003	0.001	0.001	0.001	0.001	0.001
λnm	5000																			
τ	<1E-05																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness (1.00) mm

W-ND11

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.010	0.085	0.246	0.431	0.565	0.624	0.608	0.713
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.750	0.744	0.746	0.755	0.751	0.763	0.773	0.771	0.766	0.760	0.757	0.755	0.756	0.759	0.761	0.761	0.759	0.752	0.745	0.741
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.740	0.743	0.747	0.747	0.744	0.744	0.746	0.752	0.763	0.775	0.784	0.791	0.796	0.799	0.795	0.792	0.786	0.778	0.772	0.765
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.758	0.750	0.742	0.735	0.726	0.720	0.711	0.707	0.703	0.693	0.688	0.681	0.674	0.666	0.662	0.657	0.650	0.647	0.641	0.637
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
τ	0.634	0.634	0.631	0.628	0.626	0.624	0.621	0.619	0.618	0.617	0.617	0.616	0.618	0.620	0.623	0.627				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.524	1.511	1.504	1.500	1.498	1.496	1.495
P	0.917	0.920	0.922	0.923	0.924	0.924	0.924

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

	x	y	Y	λ_d	P_e
A	0.446	0.408	69	496	0
C	0.308	0.316	69	487	1
D65	0.311	0.329	69	488	1

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	485	565	-	66	423	110	2.40

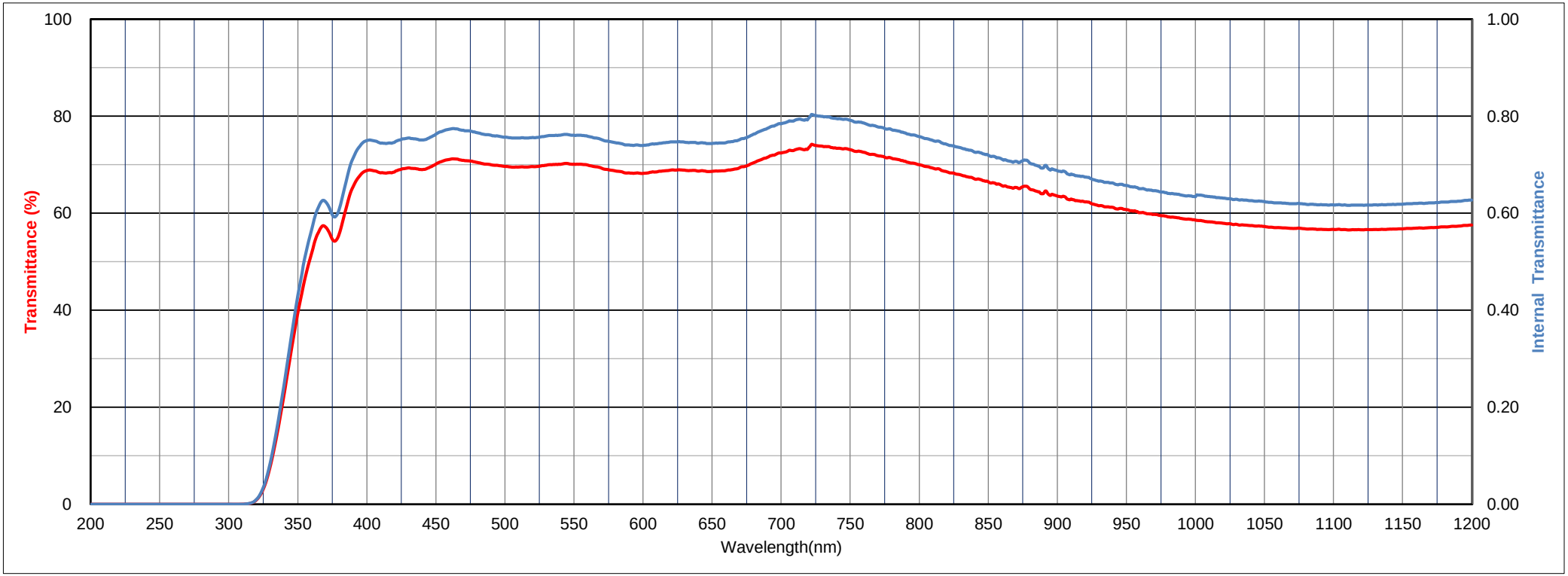
Tolerance of Transmittance (τ)

τ 405 (1)	τ 546 (2)	τ 694 (3)
0.76±0.02	0.77±0.02	0.79±0.02

(1)Internal transmittance at 405nm

(2)Internal transmittance at 546nm

(3)Internal transmittance at 694nm



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HOYA

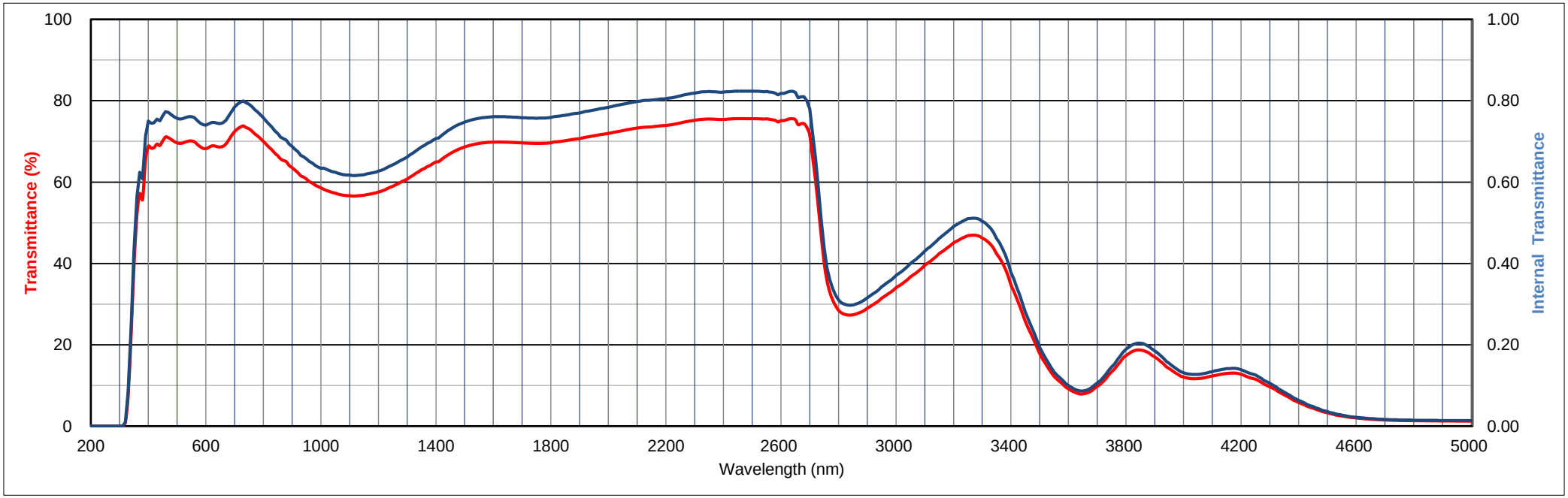
HOYA CORPORATION OPTICS SECTION

Thickness (1.00) mm

W-ND11

Internal Transmittance (τ)

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
τ	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	<1E-05	0.001	0.010	0.085	0.246	0.431	0.565	0.624	0.608	0.713
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
τ	0.750	0.744	0.746	0.755	0.751	0.763	0.773	0.771	0.766	0.760	0.757	0.755	0.756	0.759	0.761	0.761	0.759	0.752	0.745	0.741
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
τ	0.740	0.743	0.747	0.747	0.744	0.744	0.746	0.752	0.763	0.775	0.784	0.791	0.796	0.799	0.795	0.792	0.786	0.778	0.772	0.765
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
τ	0.758	0.750	0.742	0.735	0.726	0.720	0.711	0.707	0.703	0.693	0.688	0.681	0.674	0.666	0.662	0.657	0.650	0.647	0.641	0.637
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
τ	0.634	0.634	0.631	0.628	0.626	0.624	0.621	0.619	0.618	0.617	0.617	0.616	0.616	0.617	0.618	0.618	0.620	0.621	0.623	0.624
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
τ	0.627	0.629	0.632	0.636	0.639	0.642	0.646	0.650	0.654	0.658	0.662	0.667	0.671	0.677	0.681	0.687	0.690	0.695	0.698	0.703
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
τ	0.707	0.709	0.715	0.720	0.725	0.730	0.734	0.738	0.742	0.745	0.748	0.750	0.752	0.754	0.756	0.757	0.758	0.759	0.760	0.760
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
τ	0.761	0.761	0.761	0.761	0.761	0.760	0.760	0.760	0.759	0.759	0.758	0.758	0.758	0.757	0.757	0.757	0.757	0.757	0.758	0.758
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
τ	0.759	0.761	0.761	0.762	0.763	0.764	0.766	0.767	0.768	0.769	0.770	0.772	0.774	0.775	0.776	0.777	0.779	0.780	0.781	0.783
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
τ	0.784	0.791	0.798	0.801	0.805	0.812	0.819	0.822	0.821	0.823	0.823	0.823	0.818	0.821	0.780	0.439	0.310	0.298	0.316	0.342
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
τ	0.370	0.400	0.431	0.462	0.491	0.510	0.504	0.461	0.378	0.281	0.194	0.133	0.100	0.086	0.106	0.145	0.189	0.204	0.185	0.154
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
τ	0.132	0.127	0.134	0.141	0.139	0.126	0.105	0.084	0.063	0.048	0.036	0.027	0.022	0.019	0.017	0.015	0.015	0.014	0.014	0.014
λnm	5000																			
τ	0.0																			



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Heat Absorbing Filters

These slightly bluish glass filters feature high transmittance in the visible region and good absorption of heat rays (infrared rays), and include HA-5 and HA-15, which are made of silicate glass, and HA-30 and HA-50, which consist of phosphate glass. The latter efficiently absorb thermal radiations emitted from a light source, and so are highly effective when employed for slide projectors and a variety of illumination equipment.
Note: “Strengthened glass”, produced by tempering processes, may also be supplied to minimize the cracking of filter glass due to thermal shock.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA5

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	1.34E-04	0.02	0.60	5.16	18.49	37.74	54.04	66.07	75.02	78.72	79.91	77.95
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	74.02	71.98	70.18	71.15	72.72	73.07	71.88	73.23	74.44	75.53	75.33	74.76	73.41	72.83	73.58	75.34	75.52	74.69	73.21	70.88
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	67.89	64.16	59.72	54.82	49.64	44.26	38.85	34.00	28.78	23.77	19.20	15.17	11.83	9.04	6.75	4.91	3.47	2.39	1.60	1.06
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.68	0.45	0.28	0.17	0.10	0.06	0.03	0.02	0.01	0.01	3.39E-03	1.87E-03	1.02E-03	5.68E-04	3.14E-04	1.78E-04	1.04E-04	6.01E-05	3.50E-05	2.10E-05
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	1.29E-05	8.01E-06	5.13E-06	3.37E-06	2.28E-06	1.58E-06	1.12E-06	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.539	1.529	1.525	1.522	1.520	1.519	1.518
P	0.914	0.916	0.917	0.918	0.918	0.919	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

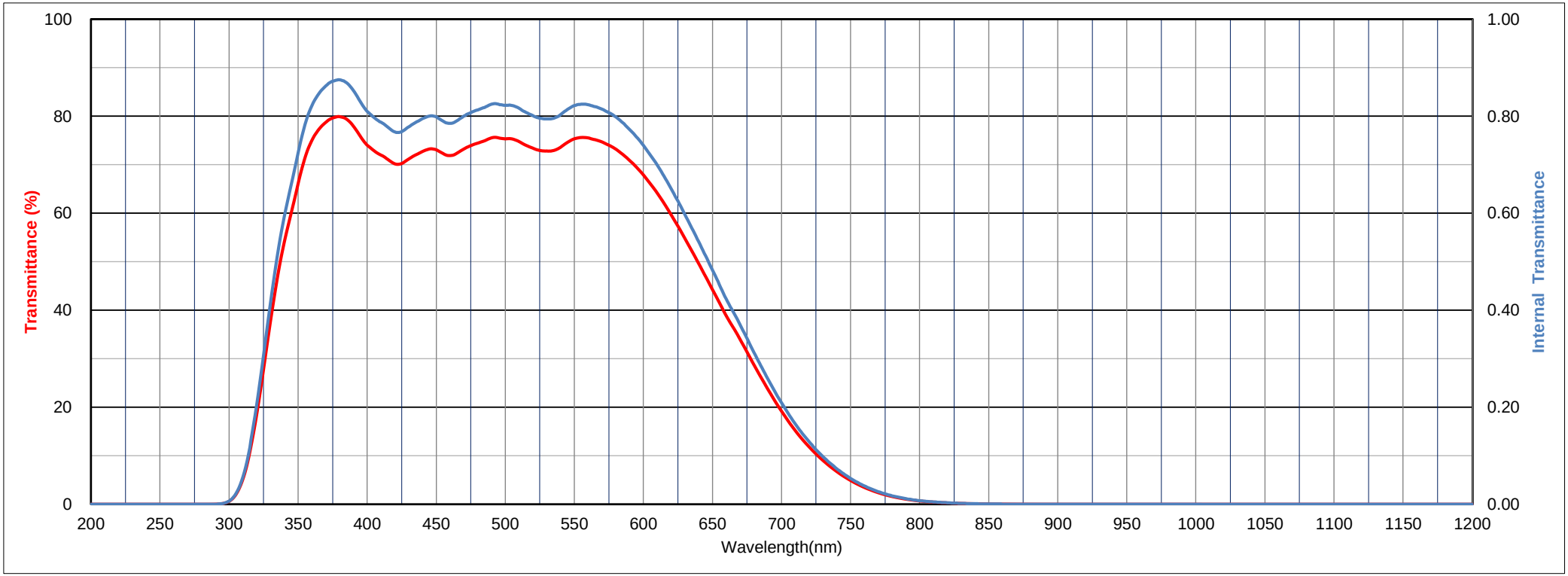
	x	y	Y	λ_d	P_e
A	0.424	0.419	69	504	5
C	0.295	0.320	71	494	5
D65	0.298	0.333	71	495	5

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	-	595	-	-	64	517	-	2.63

Tolerance of Transmittance (T)

Transmittance at 750nm	Transmittance at 1000nm	Average Transmittance at 400nm-700nm
T750(%)	T1000(%)	Tav(%)
<6	<1	63±5



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

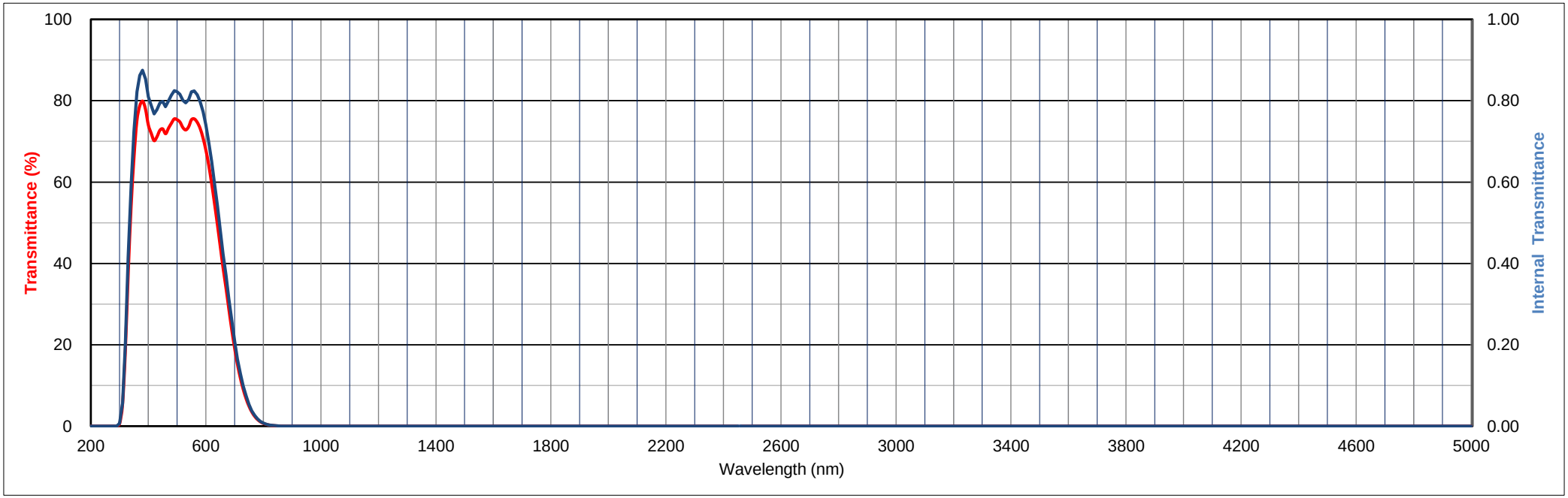
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA5

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	1.3E-04	0.02	0.60	5.16	18.49	37.74	54.04	66.07	75.02	78.72	79.91	77.95
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	74.02	71.98	70.18	71.15	72.72	73.07	71.88	73.23	74.44	75.53	75.33	74.76	73.41	72.83	73.58	75.34	75.52	74.69	73.21	70.88
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	67.89	64.16	59.72	54.82	49.64	44.26	38.85	34.00	28.78	23.77	19.20	15.17	11.83	9.04	6.75	4.91	3.47	2.39	1.60	1.06
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.68	0.45	0.28	0.17	0.10	0.06	0.03	0.02	0.01	0.01	3.4E-03	1.9E-03	1.0E-03	5.7E-04	3.1E-04	1.8E-04	1.0E-04	6.0E-05	3.5E-05	2.1E-05
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	1.3E-05	8.0E-06	5.1E-06	3.4E-06	2.3E-06	1.6E-06	1.1E-06	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	<1E-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	5000																			
T	0.00																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA15

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	4.32E-05	0.01	0.20	2.31	11.86	30.59	50.81	65.17	74.39	80.53	83.05	83.78	82.40
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	79.69	78.02	77.11	78.05	79.31	79.59	78.63	79.44	80.26	80.90	80.59	80.02	78.93	78.35	78.78	79.84	79.86	79.15	78.00	76.35
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.23	71.61	68.36	64.65	60.65	56.38	51.81	47.56	42.67	37.73	32.88	28.20	24.00	20.16	16.70	13.62	10.89	8.57	6.63	5.07
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	3.80	2.84	2.12	1.52	1.08	0.76	0.53	0.37	0.26	0.18	0.12	0.08	0.06	0.04	0.03	0.02	0.01	0.01	0.01	4.51E-03
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	3.28E-03	2.46E-03	1.86E-03	1.43E-03	1.12E-03	8.91E-04	7.22E-04	5.96E-04	5.05E-04	4.33E-04	3.75E-04	2.99E-04	2.53E-04	2.26E-04	2.12E-04	2.06E-04				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.538	1.529	1.524	1.521	1.519	1.518	1.517
P	0.914	0.916	0.917	0.918	0.919	0.919	0.919

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

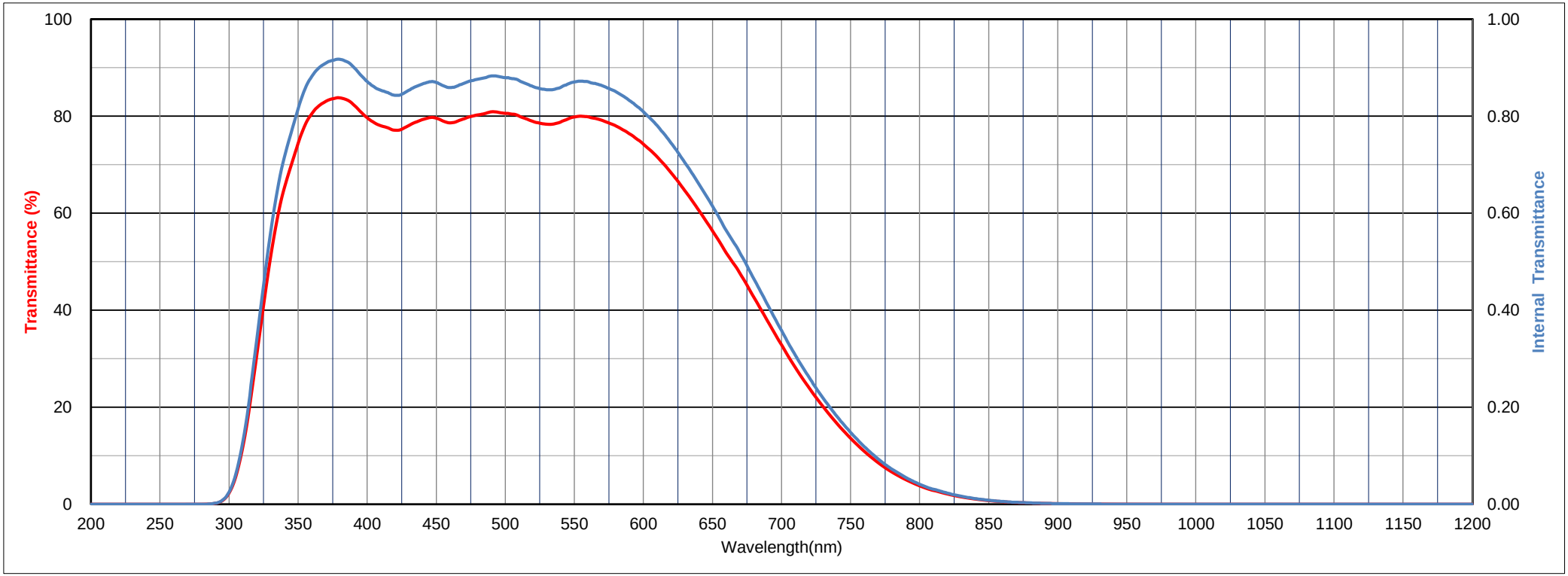
	x	y	Y	λ_d	P_e
A	0.431	0.414	75	502	4
C	0.298	0.317	77	492	4
D65	0.301	0.330	77	492	4

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	-	597	-	-	65	502	-	2.64

Tolerance of Transmittance (T)

Wavelength for Max Transmittance	Transmittance at 750nm	Average Transmittance at 400nm-700nm
λTmax(nm)	T750(%)	Tav(%)
380±5	<15	70±5



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The content of this catalog is accurate as of October ,2020

HOYA

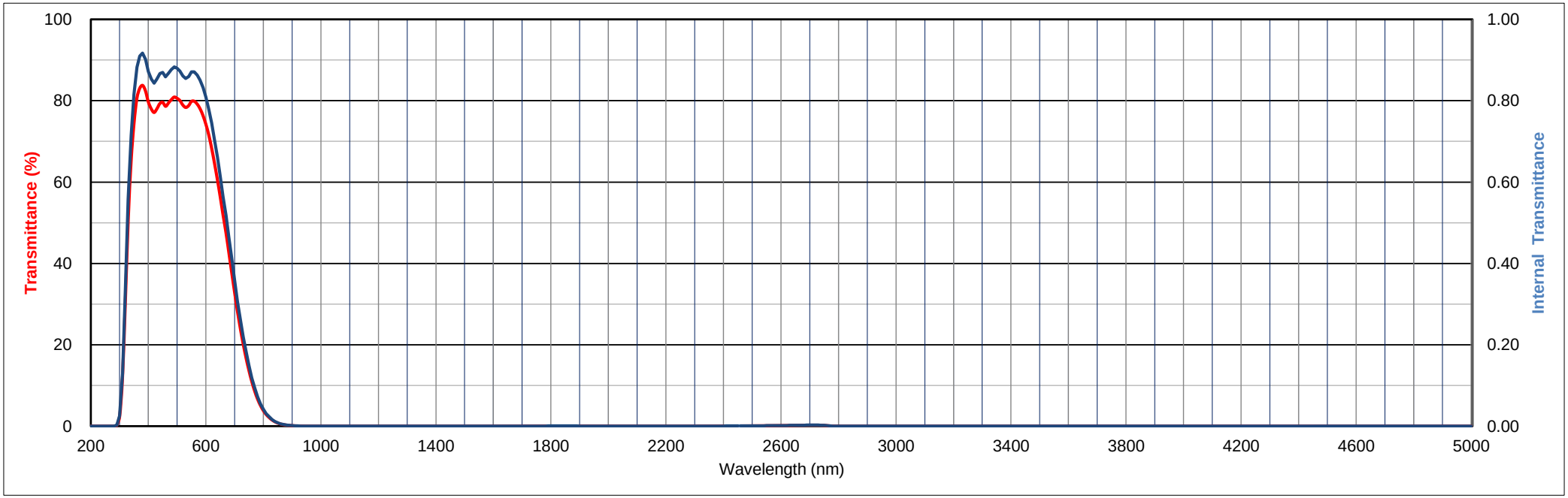
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA15

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	4.3E-05	0.01	0.20	2.31	11.86	30.59	50.81	65.17	74.39	80.53	83.05	83.78	82.40
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	79.69	78.02	77.11	78.05	79.31	79.59	78.63	79.44	80.26	80.90	80.59	80.02	78.93	78.35	78.78	79.84	79.86	79.15	78.00	76.35
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	74.23	71.61	68.36	64.65	60.65	56.38	51.81	47.56	42.67	37.73	32.88	28.20	24.00	20.16	16.70	13.62	10.89	8.57	6.63	5.07
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	3.80	2.84	2.12	1.52	1.08	0.76	0.53	0.37	0.26	0.18	0.12	0.08	0.06	0.04	0.03	0.02	0.01	0.01	0.01	0.00
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	3.3E-03	2.5E-03	1.9E-03	1.4E-03	1.1E-03	8.9E-04	7.2E-04	6.0E-04	5.0E-04	4.3E-04	3.8E-04	3.3E-04	3.0E-04	2.7E-04	2.5E-04	2.4E-04	2.3E-04	2.2E-04	2.1E-04	2.1E-04
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	2.1E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.08	0.10	0.14	0.19	0.24	0.18	0.01	0.00	0.00	0.00
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
λnm	5000																			
T	0.00																			



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The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA30

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	3.35E-04	0.05	1.30	9.24	28.21	50.81	67.65	77.92	83.91	86.23	87.11	86.49
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.91	83.92	83.41	84.01	84.78	84.97	84.47	85.03	85.55	86.00	85.83	85.57	84.98	84.71	85.01	85.65	85.77	85.46	84.81	83.87
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	82.57	80.92	78.88	76.44	73.73	70.68	67.28	64.04	60.11	55.98	51.68	47.26	43.02	38.84	34.77	30.83	27.01	23.44	20.14	17.18
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	14.48	12.20	10.26	8.45	6.93	5.60	4.50	3.64	2.93	2.33	1.86	1.48	1.18	0.94	0.75	0.61	0.49	0.40	0.33	0.27
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.23	0.19	0.16	0.14	0.12	0.10	0.09	0.09	0.08	0.08	0.07	0.06	0.05	0.05	0.05	0.05				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.533	1.524	1.519	1.516	1.514	1.513	1.512
P	0.915	0.917	0.919	0.919	0.920	0.920	0.920

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

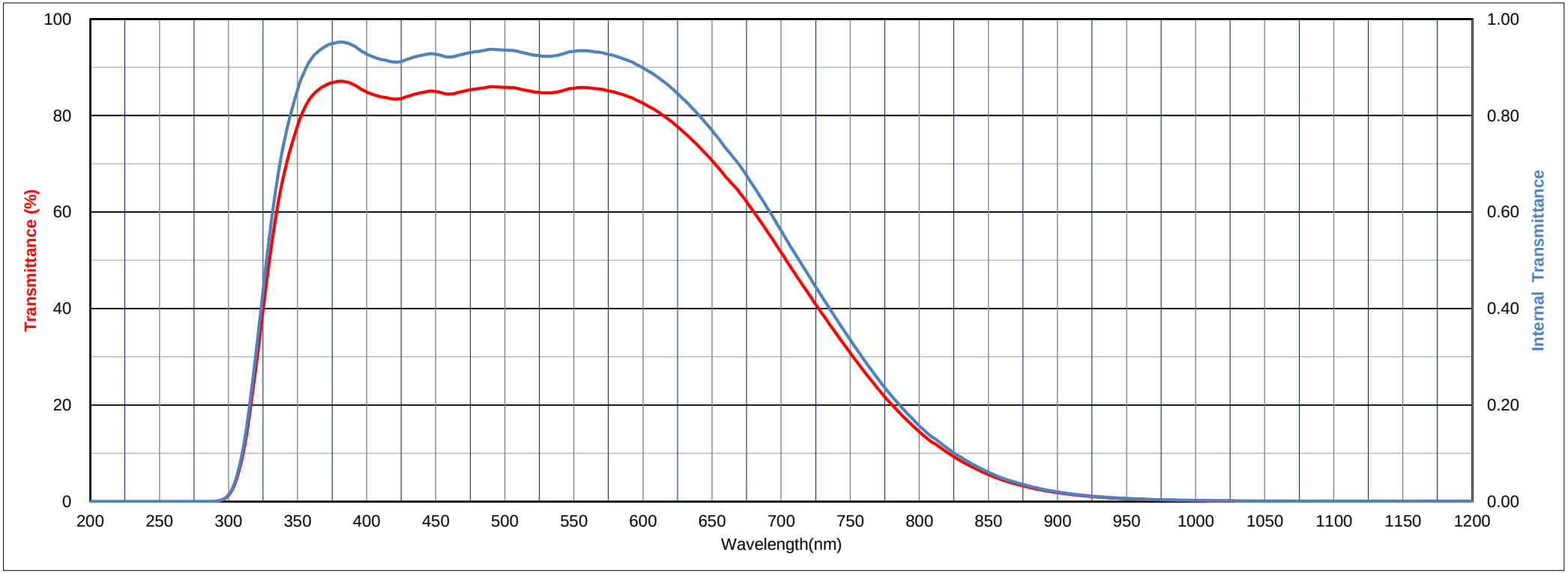
	x	y	Y	λ_d	P_e
A	0.438	0.412	83	503	2
C	0.304	0.317	84	493	2
D65	0.307	0.330	84	494	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	-	565	620	-	66	-	-	2.61

Tolerance of Transmittance (T)

Transmittance at 750nm	Transmittance at 1000nm	Average Transmittance at 400nm-700nm
T750(%)	T1000(%)	Tav(%)
<35	<1	80±5



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The content of this catalog is accurate as of October ,2020

HOYA

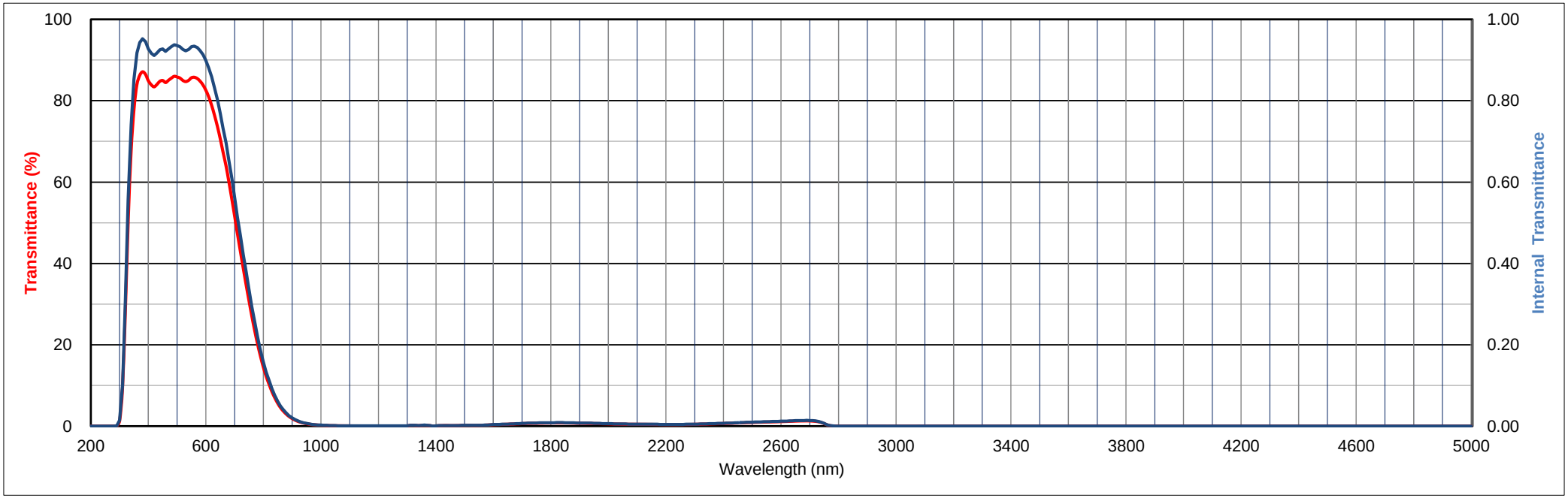
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA30

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	3.4E-04	0.05	1.30	9.24	28.21	50.81	67.65	77.92	83.91	86.23	87.11	86.49
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	84.91	83.92	83.41	84.01	84.78	84.97	84.47	85.03	85.55	86.00	85.83	85.57	84.98	84.71	85.01	85.65	85.77	85.46	84.81	83.87
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	82.57	80.92	78.88	76.44	73.73	70.68	67.28	64.04	60.11	55.98	51.68	47.26	43.02	38.84	34.77	30.83	27.01	23.44	20.14	17.18
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	14.48	12.20	10.26	8.45	6.93	5.60	4.50	3.64	2.93	2.33	1.86	1.48	1.18	0.94	0.75	0.61	0.49	0.40	0.33	0.27
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.23	0.19	0.16	0.14	0.12	0.10	0.09	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.18	0.22	0.17	0.13	0.17	0.23	0.17	0.12	0.01
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.06	0.11	0.13	0.16	0.16	0.13	0.13	0.14	0.16	0.19	0.19	0.21	0.20	0.18	0.18	0.20	0.21	0.25	0.29	0.32
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.36	0.39	0.41	0.43	0.45	0.47	0.51	0.53	0.57	0.59	0.63	0.66	0.68	0.69	0.71	0.71	0.73	0.73	0.76	0.76
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.78	0.79	0.79	0.79	0.79	0.78	0.77	0.76	0.74	0.72	0.71	0.70	0.69	0.67	0.66	0.65	0.64	0.62	0.60	0.59
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	0.57	0.49	0.46	0.44	0.39	0.40	0.46	0.55	0.66	0.78	0.91	1.01	1.12	1.24	1.28	0.64	0.00	0.00	0.01	0.00
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
λnm	5000																			
T	0.00																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA50

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	3.09E-03	0.32	2.91	11.77	29.03	49.56	66.40	77.11	82.72	85.84	87.94	88.59	88.69	87.92
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	86.60	85.85	85.19	85.46	85.98	86.05	85.66	86.11	86.55	86.82	86.70	86.45	85.95	85.63	85.82	86.24	86.21	85.90	85.33	84.52
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	83.49	82.17	80.49	78.56	76.40	73.95	71.17	68.49	65.19	61.70	57.97	54.11	50.29	46.48	42.71	38.90	35.16	31.52	28.05	24.83
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	21.79	19.12	16.78	14.43	12.43	10.60	8.97	7.61	6.47	5.46	4.59	3.86	3.26	2.75	2.32	1.98	1.70	1.45	1.26	1.09
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.95	0.83	0.74	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.37	0.33	0.31	0.29	0.28	0.28				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.528	1.519	1.515	1.512	1.510	1.509	1.508
P	0.916	0.919	0.920	0.920	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

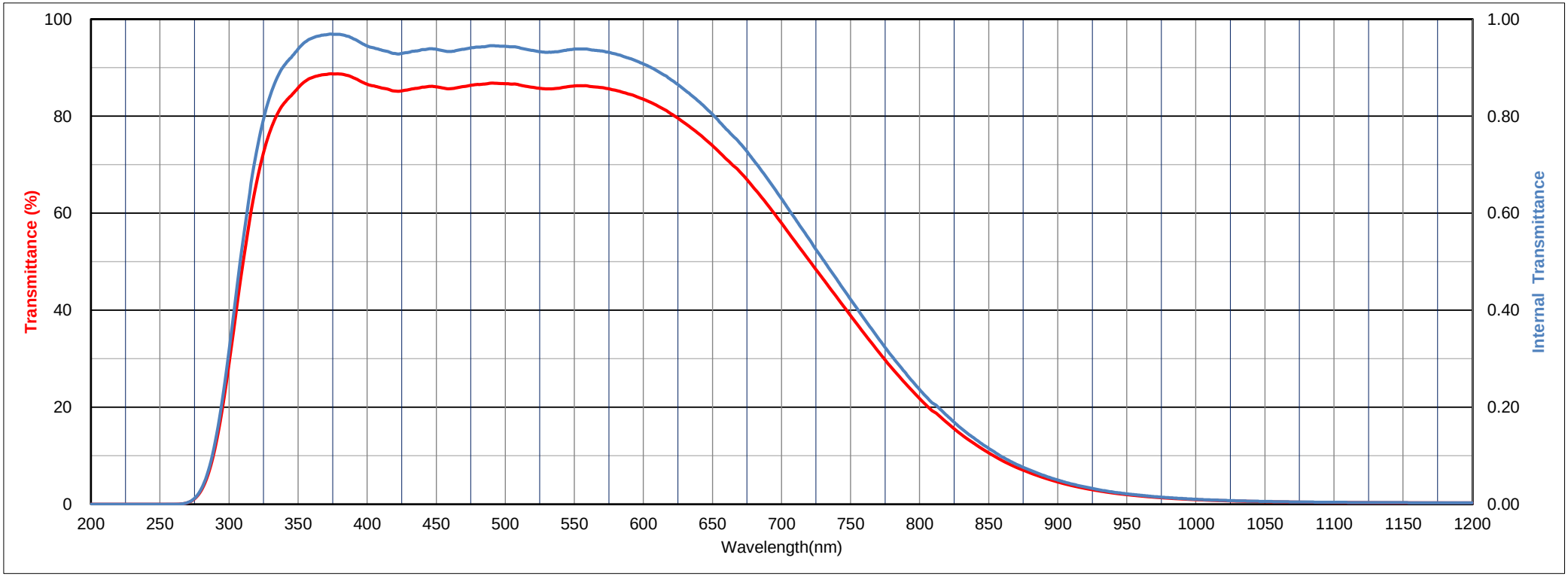
	x	y	Y	λ_d	P_e
A	0.440	0.411	84	502	2
C	0.305	0.316	85	491	2
D65	0.307	0.329	85	493	2

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	-	560	615	-	66	-	-	2.60

Tolerance of Transmittance (T)

Transmittance at 750nm	Transmittance at 1000nm	Average Transmittance at 400nm-700nm
T750(%)	T1000(%)	Tav(%)
<55	<3	80±5



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The content of this catalog is accurate as of October ,2020

HOYA

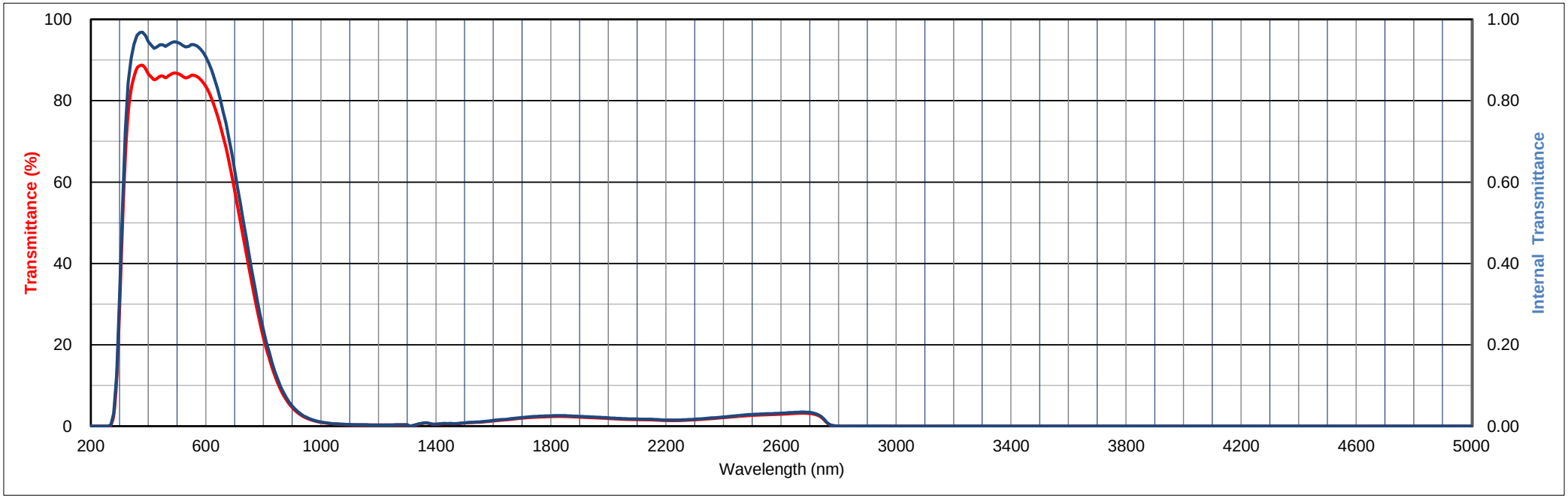
HOYA CORPORATION OPTICS SECTION

Thickness 3.00 mm

HA50

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	<1E-6	0.00	0.32	2.91	11.77	29.03	49.56	66.40	77.11	82.72	85.84	87.94	88.59	88.69	87.92
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	86.60	85.85	85.19	85.46	85.98	86.05	85.66	86.11	86.55	86.82	86.70	86.45	85.95	85.63	85.82	86.24	86.21	85.90	85.33	84.52
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	83.49	82.17	80.49	78.56	76.40	73.95	71.17	68.49	65.19	61.70	57.97	54.11	50.29	46.48	42.71	38.90	35.16	31.52	28.05	24.83
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	21.79	19.12	16.78	14.43	12.43	10.60	8.97	7.61	6.47	5.46	4.59	3.86	3.26	2.75	2.32	1.98	1.70	1.45	1.26	1.09
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.95	0.83	0.74	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.37	0.35	0.33	0.32	0.31	0.30	0.29	0.29	0.28	0.28
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.28	0.28	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.00	0.13	0.31	0.49	0.62	0.75	0.75	0.60	0.44
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.45	0.50	0.56	0.60	0.58	0.60	0.57	0.58	0.64	0.71	0.77	0.82	0.87	0.90	0.94	0.96	1.00	1.09	1.14	1.22
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	1.29	1.36	1.42	1.49	1.54	1.60	1.68	1.75	1.84	1.90	1.97	2.04	2.09	2.14	2.18	2.21	2.24	2.27	2.30	2.33
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	2.35	2.37	2.39	2.39	2.38	2.37	2.35	2.32	2.29	2.25	2.22	2.19	2.16	2.12	2.09	2.06	2.03	1.99	1.96	1.93
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	1.88	1.71	1.60	1.54	1.40	1.40	1.56	1.81	2.09	2.39	2.65	2.80	2.93	3.13	3.11	1.54	0.01	0.00	0.00	0.00
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.01	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
λnm	5000																			
T	0.00																			



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Ultraviolet Transmitting, Visible Absorbing Filters

These are dark glass filters, nearly black, which transmit the ultraviolet region but absorb the visible region. They transmit slightly in the near-infrared region.

The glass type figure represents the wavelength that provides the maximum transmittance. These filters are chiefly used for single extraction of the ultraviolet rays, and are often utilized for selectively transmitting the 253.7nm and 365nm wavelengths, which are the representative line spectra of mercury lamps.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U330

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.4	17.6	52.1	72.4	80.2	84.9	87.0	87.7	87.9	88.1	87.9	87.5	86.9	85.2	79.8	65.4	38.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	12.8	3.1	0.9	0.4	0.3	0.4	0.5	0.5	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.1	1.1	5.4	15.5	30.2	42.0	48.0	49.6	47.5	43.7	39.5	35.6	32.2	29.3	27.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	25.4	24.2	23.4	22.8	22.5	22.3	22.4	22.5	22.8	23.2	23.7	24.3	25.0	25.8	26.7	27.6	28.6	29.5	30.4	31.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	32.1	32.7	33.2	33.5	33.6	33.4	33.1	32.5	31.7	30.7	29.5	26.8	23.7	20.8	17.9	15.4				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.567	1.557	1.552	1.549	1.547	1.545	1.544
P	0.907	0.909	0.911	0.911	0.912	0.912	0.912

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

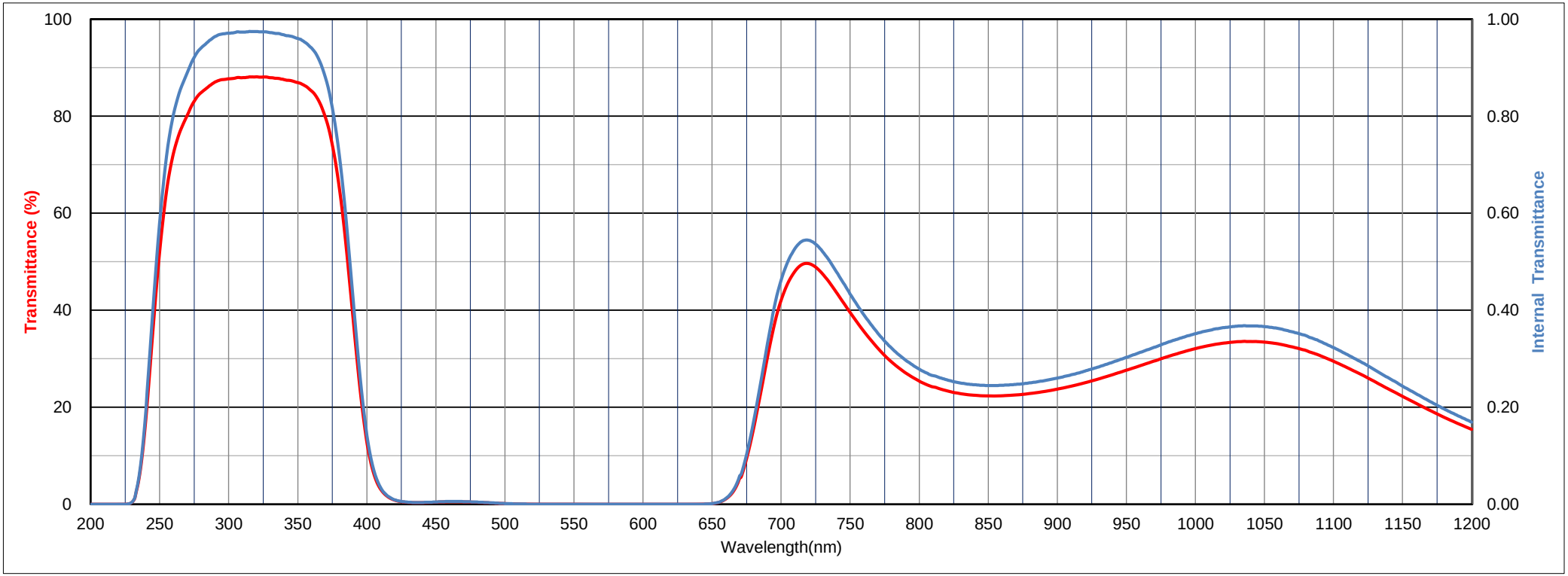
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	5	470	505	82	93	420	230	2.78

Tolerance of Transmittance (T)

Maximum Transmittance	Transmittance at 254nm	Transmittance at 405nm
Tmax(%)	T254(%)	T405(%)
85±5	>40	<15



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HOYA

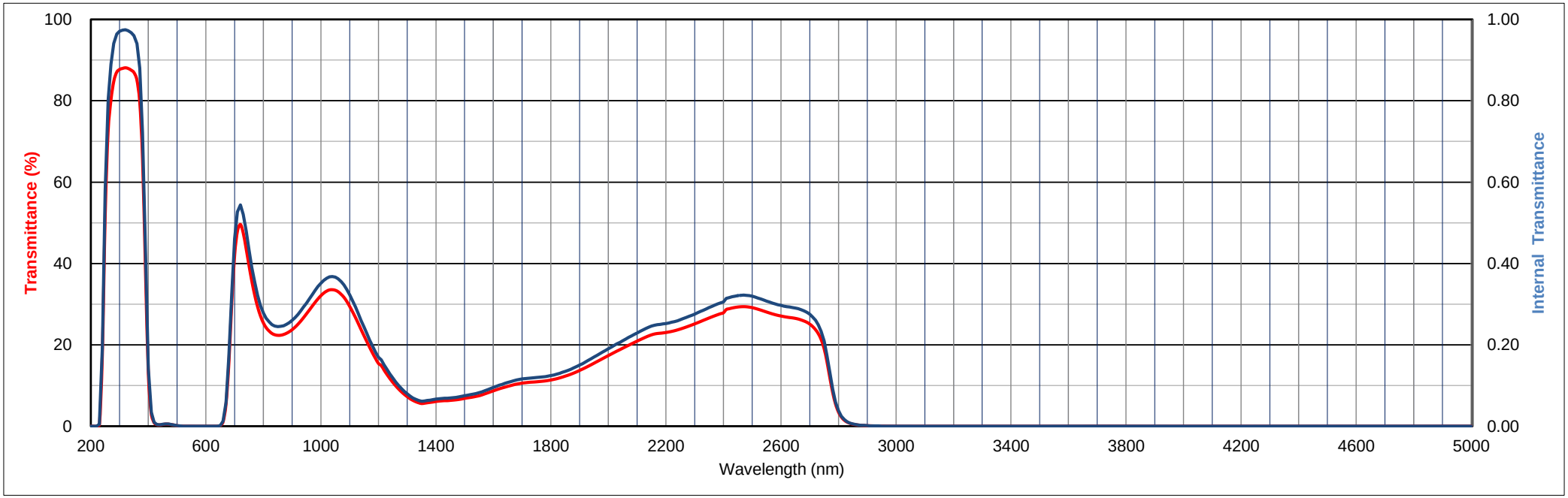
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U330

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.4	17.6	52.1	72.4	80.2	84.9	87.0	87.7	87.9	88.1	87.9	87.5	86.9	85.2	79.8	65.4	38.4
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	12.8	3.1	0.9	0.4	0.3	0.4	0.5	0.5	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.1	1.1	5.4	15.5	30.2	42.0	48.0	49.6	47.5	43.7	39.5	35.6	32.2	29.3	27.1
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	25.4	24.2	23.4	22.8	22.5	22.3	22.4	22.5	22.8	23.2	23.7	24.3	25.0	25.8	26.7	27.6	28.6	29.5	30.4	31.3
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	32.1	32.7	33.2	33.5	33.6	33.4	33.1	32.5	31.7	30.7	29.5	28.1	26.8	25.3	23.7	22.2	20.8	19.3	17.9	16.6
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	15.4	14.9	13.8	12.7	11.7	10.8	9.9	9.2	8.5	7.8	7.3	6.8	6.4	6.0	5.8	5.6	5.6	5.8	5.9	6.0
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	6.1	6.2	6.2	6.3	6.3	6.3	6.4	6.5	6.6	6.7	6.8	7.0	7.1	7.2	7.3	7.5	7.7	8.0	8.2	8.4
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	8.7	8.9	9.2	9.4	9.6	9.8	10.0	10.2	10.3	10.5	10.6	10.7	10.8	10.8	10.9	10.9	11.0	11.1	11.1	11.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	11.4	11.5	11.7	11.9	12.1	12.3	12.5	12.8	13.1	13.4	13.7	14.0	14.4	14.7	15.1	15.5	15.9	16.2	16.6	17.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	17.4	19.2	20.9	22.5	23.0	23.9	25.2	26.6	27.9	29.3	29.1	28.1	27.1	26.5	25.1	19.1	3.5	0.5	0.1	0.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U340

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.2	7.8	30.7	54.3	67.5	73.4	75.9	76.7	75.9	72.3	63.0	39.7	9.4	0.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	1.6	2.1	2.1	1.4	0.7	0.3	0.1	0.1	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.587	1.576	1.571	1.568	1.565	1.563	1.562
P	0.902	0.905	0.906	0.907	0.907	0.908	0.908

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

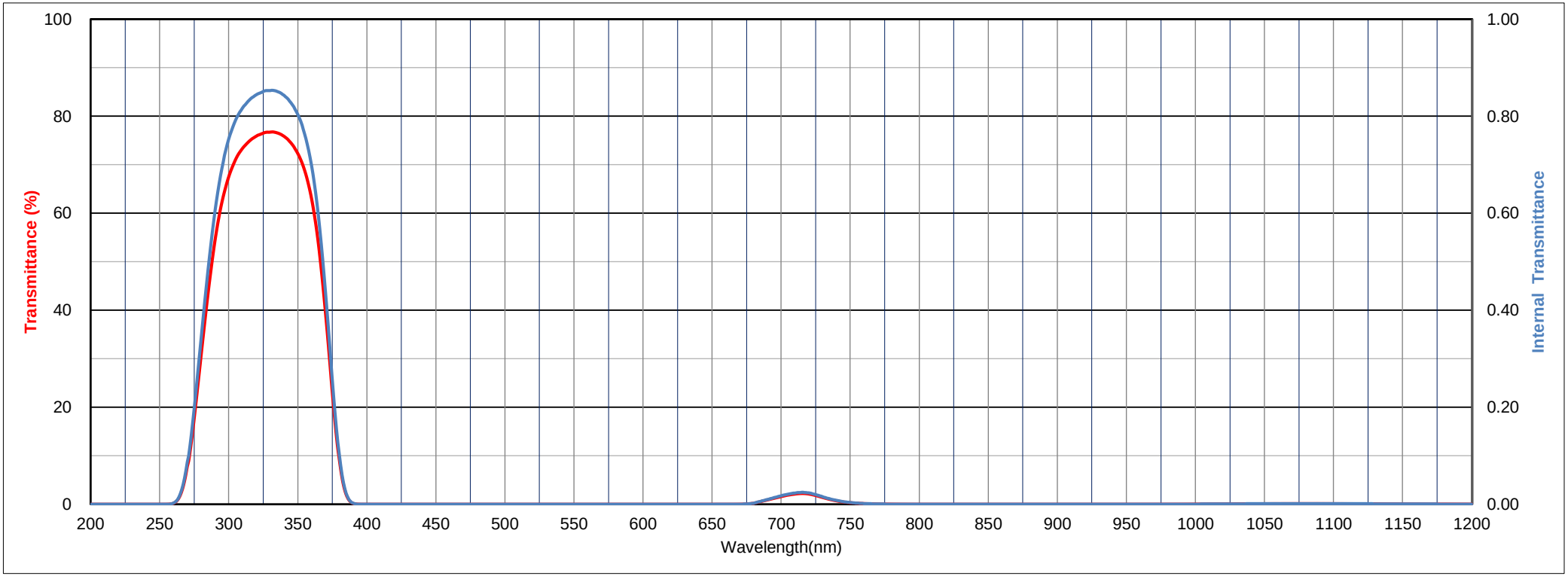
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	4	530	565	85	96	430	250	2.92

Tolerance of Transmittance (T)

Maximum Transmittance	Transmittance at 254nm	Transmittance at 405nm
Tmax(%)	T254(%)	T405(%)
75±5	<1	<0.1



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

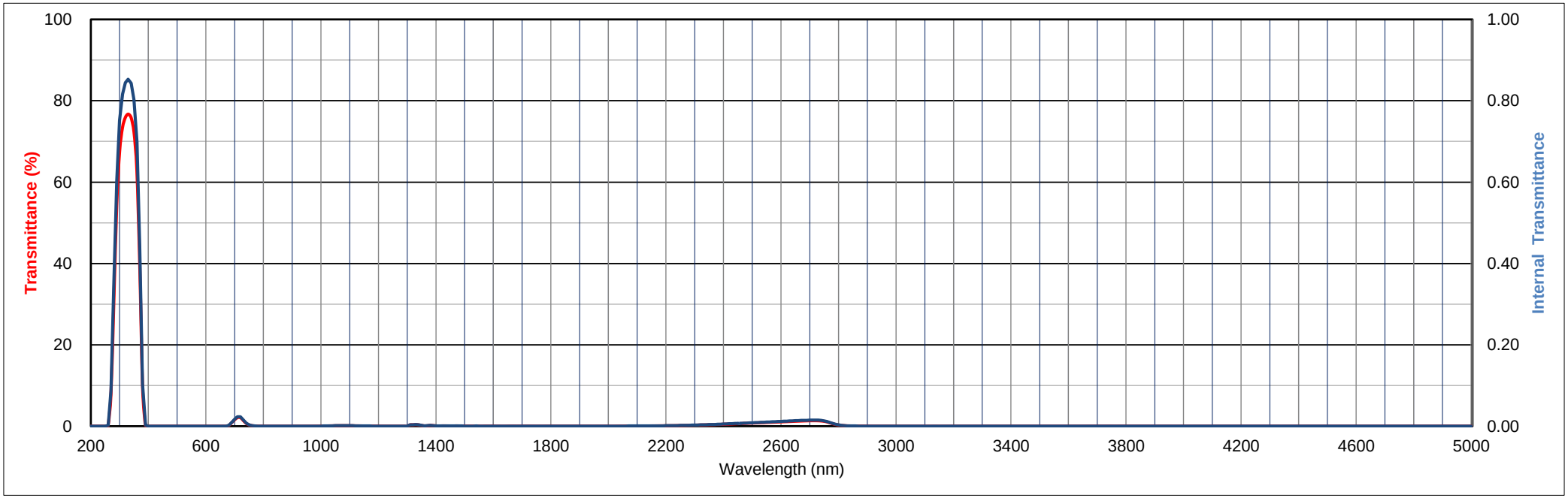
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U340

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.2	7.8	30.7	54.3	67.5	73.4	75.9	76.7	75.9	72.3	63.0	39.7	9.4	0.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.9	1.6	2.1	2.1	1.4	0.7	0.3	0.1	0.1	0.0	0.0
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.4	0.3	0.2	0.1	0.1	0.2	0.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.1	1.2	1.3	1.2	0.3	0.1	0.0	0.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U360

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	24.9	47.9	62.2	69.2	72.1	71.0	62.3	38.0	8.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.2	5.5	7.7	9.6	9.1	6.7	4.0	2.6	1.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.3	0.9	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.552	1.542	1.537	1.534	1.532	1.531	1.531
P	0.911	0.913	0.914	0.915	0.915	0.916	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

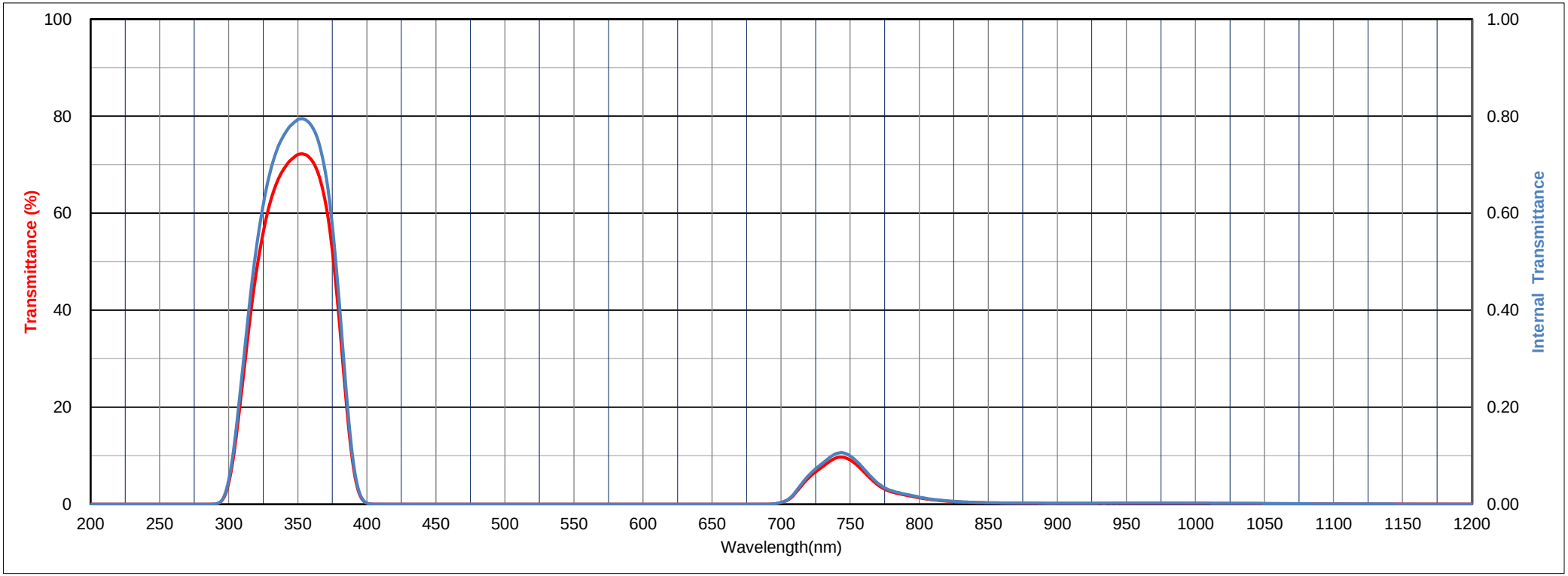
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
3	2	520	560	100	111	560	140	2.74

Tolerance of Transmittance (T)

Maximum Transmittance	Transmittance at 254nm	Transmittance at 405nm
Tmax(%)	T254(%)	T405(%)
70±5	<0.01	<1



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HOYA

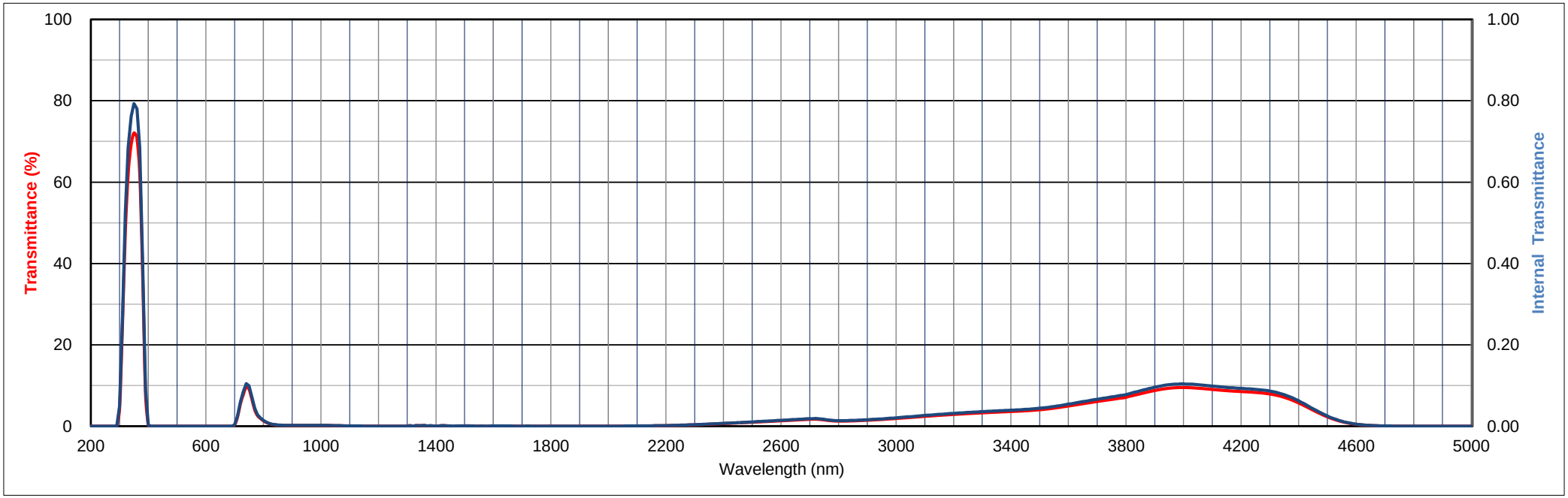
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

U360

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	24.9	47.9	62.2	69.2	72.1	71.0	62.3	38.0	8.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.2	5.5	7.7	9.6	9.1	6.7	4.0	2.6	1.9
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	1.3	0.9	0.6	0.5	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.1	0.1	0.2	0.0	0.1	0.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.0	1.1	1.3	1.5	1.7	1.5	1.3	1.3	1.5	1.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	1.9	2.2	2.4	2.7	2.9	3.1	3.3	3.5	3.6	3.8	4.0	4.4	5.0	5.5	6.1	6.6	7.1	8.0	8.8	9.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	9.5	9.3	9.0	8.7	8.5	8.3	7.9	7.1	5.7	4.0	2.3	1.1	0.5	0.2	0.1	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UL254S

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	4.0	34.4	65.1	78.2	82.7	86.2	88.0	88.6	88.8	88.9	88.7	88.4	88.0	87.0	84.1	75.4	56.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	30.3	12.5	5.4	2.9	2.3	2.1	1.8	1.2	0.7	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.1	0.9	5.1	17.5	35.2	50.1	58.5	61.7	61.2	58.7	55.5	52.2	49.2	46.4	44.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	42.3	40.7	39.5	38.6	37.9	37.4	37.0	36.8	36.6	36.6	36.7	36.8	37.1	37.4	37.8	38.2	38.7	39.1	39.6	40.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	40.4	40.7	40.8	40.8	40.6	40.2	39.6	38.8	37.8	36.7	35.3	32.3	29.0	25.7	22.5	19.6				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.566	1.556	1.551	1.548	1.546	1.544	1.543
K	1.4E-05	9.9E-05	2.2E-04	9.5E-06	1.5E-05	2.0E-05	1.9E-05
P	0.907	0.910	0.911	0.912	0.912	0.912	0.913

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

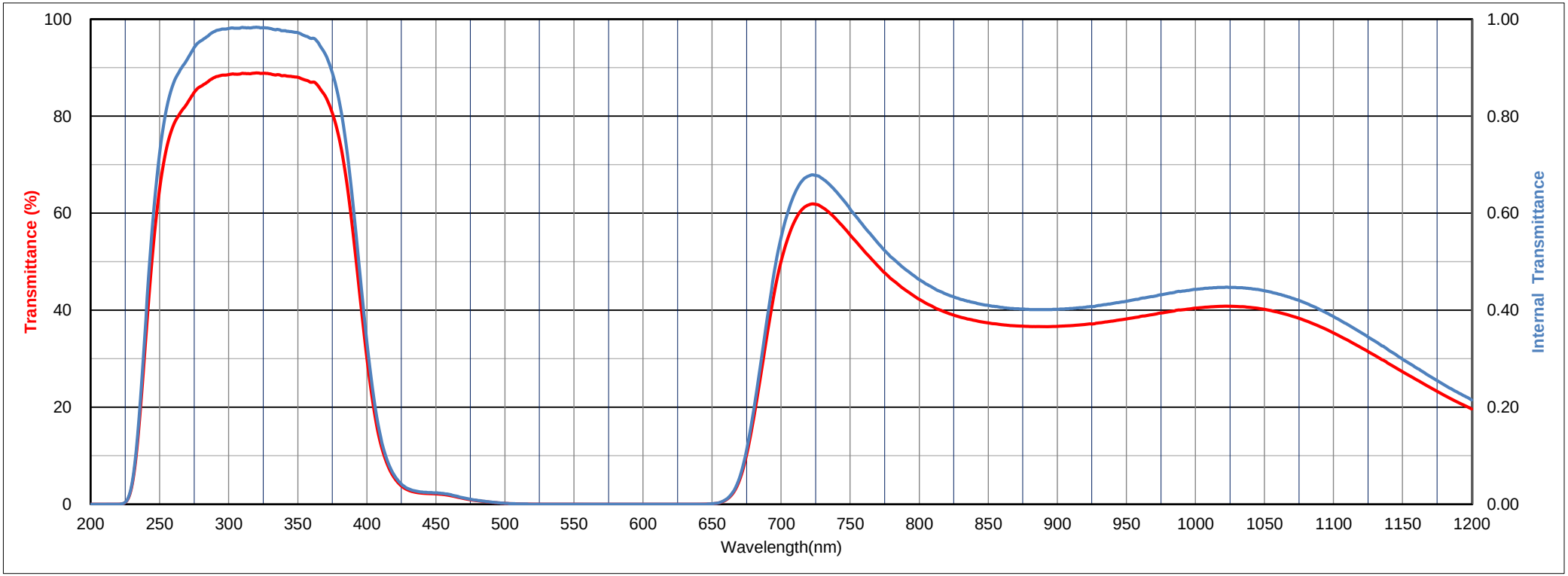
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	3	450	500	93	65	380	220	2.89

Tolerance of Transmittance (T)

Transmittance at 254nm	Transmittance at 310nm	Transmittance at 365nm
T254(%)	T310(%)	T365(%)
≥70	≥85	≥83



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HOYA

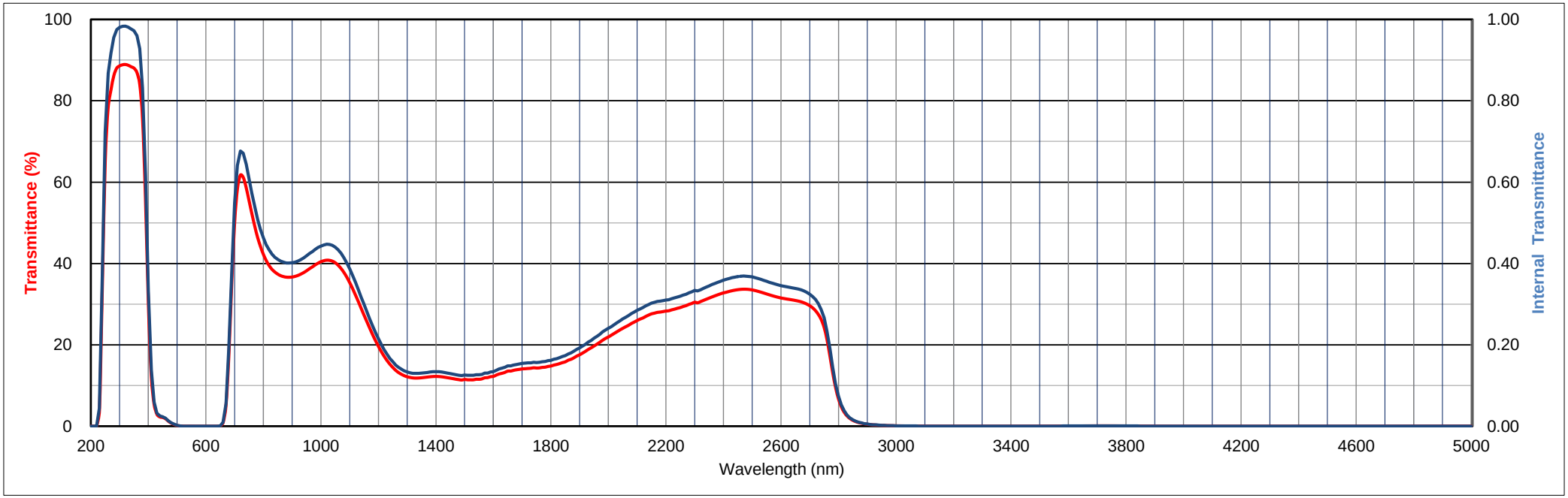
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

UL254S

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	4.0	34.4	65.1	78.2	82.7	86.2	88.0	88.6	88.8	88.9	88.7	88.4	88.0	87.0	84.1	75.4	56.0
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	30.3	12.5	5.4	2.9	2.3	2.1	1.8	1.2	0.7	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.1	0.9	5.1	17.5	35.2	50.1	58.5	61.7	61.2	58.7	55.5	52.2	49.2	46.4	44.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	42.3	40.7	39.5	38.6	37.9	37.4	37.0	36.8	36.6	36.6	36.7	36.8	37.1	37.4	37.8	38.2	38.7	39.1	39.6	40.1
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	40.4	40.7	40.8	40.8	40.6	40.2	39.6	38.8	37.8	36.7	35.3	33.9	32.3	30.7	29.0	27.3	25.7	24.1	22.5	21.0
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	19.6	18.3	17.2	16.1	15.2	14.5	13.7	13.2	12.8	12.4	12.2	12.0	11.9	11.8	11.9	11.9	12.0	12.1	12.2	12.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	12.2	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.4	11.3	11.5	11.4	11.4	11.4	11.5	11.5	11.6	11.9	11.9	12.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	12.2	12.6	12.8	13.0	13.2	13.5	13.6	13.7	13.9	14.0	14.1	14.1	14.2	14.2	14.4	14.3	14.3	14.5	14.5	14.7
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	14.8	15.0	15.2	15.4	15.6	15.8	16.2	16.5	16.8	17.2	17.6	18.0	18.4	18.9	19.3	19.7	20.2	20.6	21.1	21.6
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	21.9	24.1	26.0	27.6	28.3	29.2	30.5	31.5	32.8	33.6	33.5	32.5	31.5	30.9	29.6	24.3	6.7	1.4	0.5	0.2
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



All data is mean values of various melts.

The content of this catalog is accurate as of October ,2020

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 3.25 mm

UL365S

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.8	16.1	37.3	56.6	69.6	76.8	80.1	78.6	68.3	41.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.5	10.7	21.3	31.1	39.9	40.8	33.6	26.1	24.3	23.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	20.9	17.8	15.1	12.9	11.2	9.9	9.0	8.3	7.8	7.4	7.1	6.8	6.6	6.4	6.2	6.0	5.8	5.6	5.3	5.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	4.7	4.3	3.9	3.5	3.2	2.8	2.5	2.2	1.9	1.7	1.5	1.2	1.0	0.9	0.7	0.7				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.550	1.539	1.532	1.529	1.526	1.525	1.524
P	0.911	0.914	0.915	0.916	0.917	0.917	0.917

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

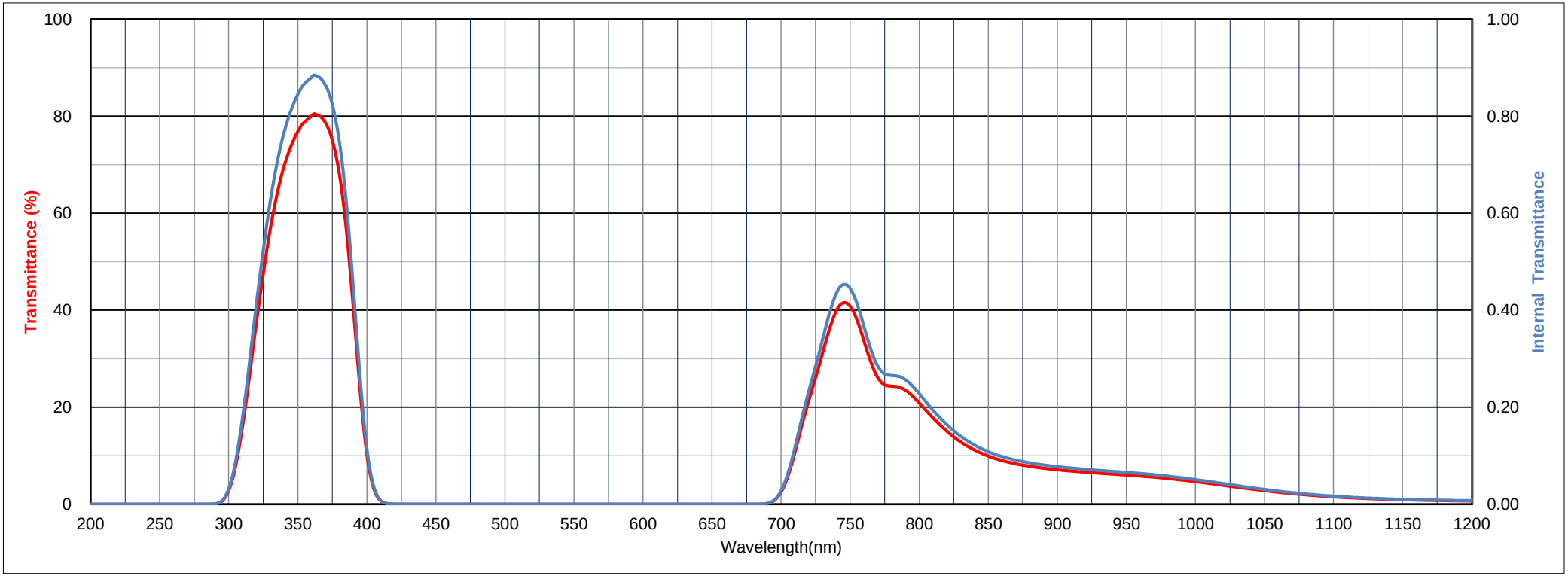
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	527	687	88	-	490	100	2.61

Tolerance of Transmittance (T)

Maximum Transmittance	Transmittance at 254nm	Transmittance at 405nm
Tmax(%)	T254(%)	T405(%)
≧73%	≦7%	≦3%



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HOYA

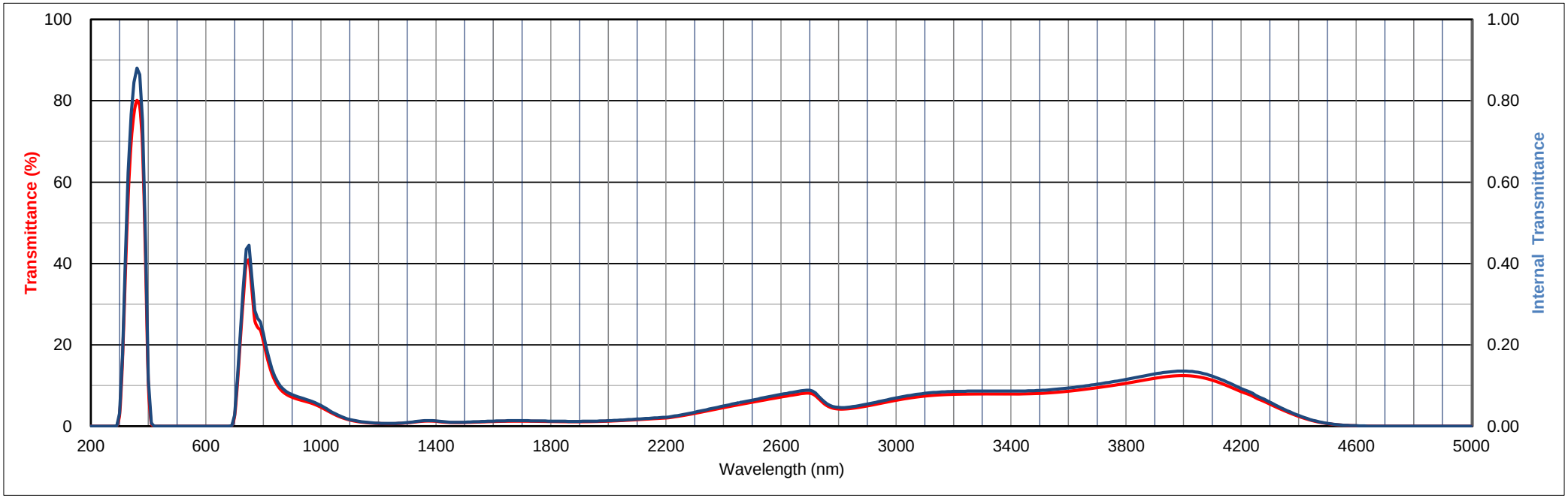
HOYA CORPORATION OPTICS SECTION

Thickness 3.25 mm

UL365S

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.8	16.1	37.3	56.6	69.6	76.8	80.1	78.6	68.3	41.2
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	10.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.5	10.7	21.3	31.1	39.9	40.8	33.6	26.1	24.3	23.5
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	20.9	17.8	15.1	12.9	11.2	9.9	9.0	8.3	7.8	7.4	7.1	6.8	6.6	6.4	6.2	6.0	5.8	5.6	5.3	5.0
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	4.7	4.3	3.9	3.5	3.2	2.8	2.5	2.2	1.9	1.7	1.5	1.4	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	1.2	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	1.2	1.4	1.6	1.8	2.0	2.5	3.1	3.8	4.6	5.2	5.9	6.5	7.2	7.8	8.1	5.5	4.2	4.4	5.0	5.7
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	6.4	7.0	7.4	7.7	7.8	7.9	7.9	7.9	7.9	8.0	8.1	8.3	8.6	9.0	9.5	10.0	10.5	11.2	11.8	12.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	12.4	12.1	11.3	10.0	8.5	7.0	5.4	3.8	2.4	1.3	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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Multiband Calibration Filters

V10 and V11 contain neodymium and HY1 contains holmium, all of which can remarkably absorb specific wavelengths.

Multiband calibration filters are used as a wavelength calibration and dual-color-type filter.

HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

V10

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	6.5	62.3	75.9	82.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.9	87.3	86.1	63.2	47.5	56.2	59.5	49.4	44.1	75.3	74.2	51.8	52.2	24.4	65.9	84.5	81.3	5.2	3.0	1.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	24.2	56.7	86.8	84.6	88.7	89.6	89.5	84.7	77.3	77.7	88.0	89.3	86.5	67.3	5.6	8.7	43.6	69.5	67.8	32.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	9.0	3.5	38.8	67.2	83.7	85.7	71.0	49.1	30.5	57.8	74.3	83.7	86.9	89.8	90.4	90.3	90.0	89.8	89.6	88.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	88.9	89.2	89.7	90.2	90.5	90.8	91.1	91.2	91.3	91.3	91.4	91.5	91.5	91.6	91.5	91.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.551	1.538	1.530	1.526	1.523	1.522	1.520
P	0.911	0.914	0.916	0.917	0.918	0.918	0.918

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

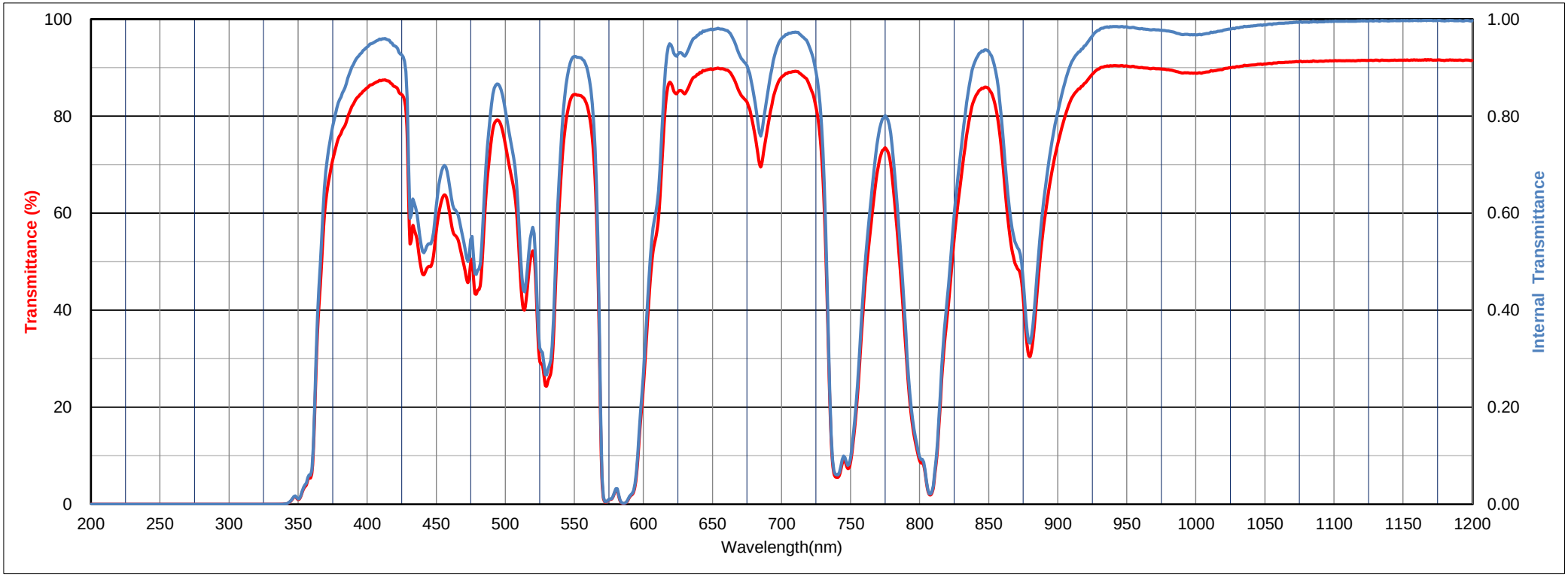
	x	y	Y	λ_d	P_e
A	0.453	0.383	48	-565	10
C	0.295	0.292	49	467	9
D65	0.297	0.304	49	466	9

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	1	500	545	103	117	520	130	2.87

Tolerance of Transmittance (T)

Transmittance at 550nm	Wavelength for Min. Transmittance
T550(%)	λ Tmin(nm)
>80	586±1



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HOYA

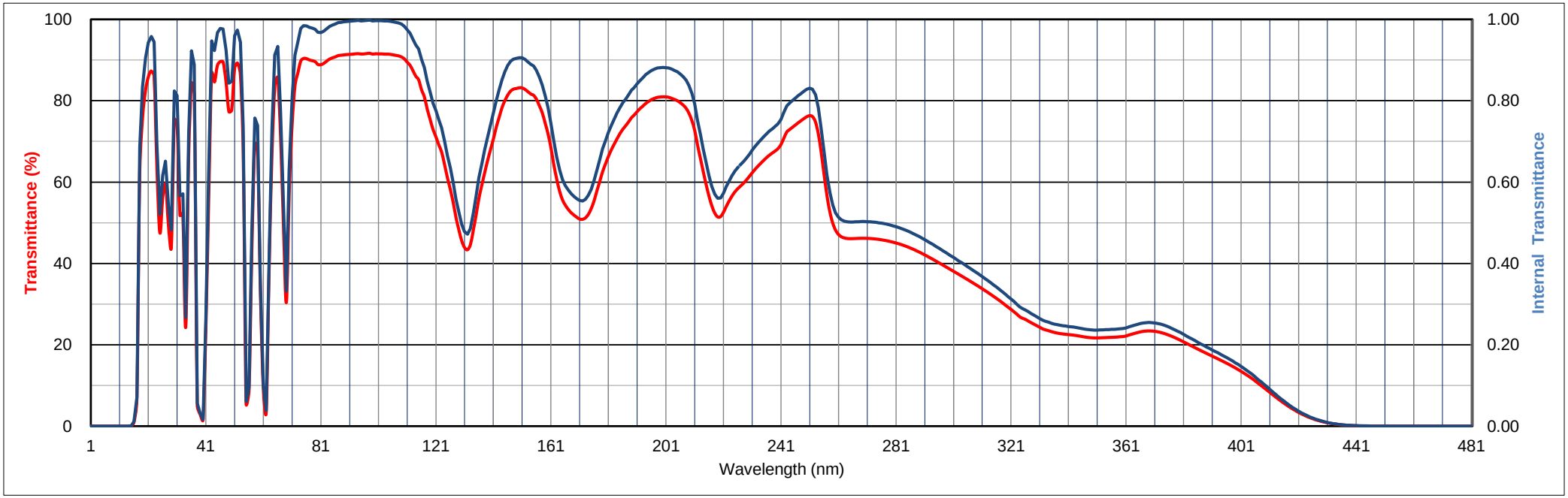
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

V10

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	6.5	62.3	75.9	82.5
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	85.9	87.3	86.1	63.2	47.5	56.2	59.5	49.4	44.1	75.3	74.2	51.8	52.2	24.4	65.9	84.5	81.3	5.2	3.0	1.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	24.2	56.7	86.8	84.6	88.7	89.6	89.5	84.7	77.3	77.7	88.0	89.3	86.5	67.3	5.6	8.7	43.6	69.5	67.8	32.2
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	9.0	3.5	38.8	67.2	83.7	85.7	71.0	49.1	30.5	57.8	74.3	83.7	86.9	89.8	90.4	90.3	90.0	89.8	89.6	88.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	88.9	89.2	89.7	90.2	90.5	90.8	91.1	91.2	91.3	91.3	91.4	91.4	91.5	91.6	91.5	91.5	91.6	91.7	91.5	91.5
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	91.5	91.5	91.5	91.5	91.4	91.3	91.2	91.0	90.8	90.3	89.5	88.7	87.4	86.0	85.1	82.7	80.9	77.9	75.4	72.9
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	71.2	69.1	67.4	64.3	61.1	58.2	55.0	51.3	48.2	45.5	43.9	43.4	44.6	48.1	52.0	56.1	59.3	62.4	65.3	68.0
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	70.6	73.5	75.9	78.3	80.0	81.4	82.4	82.9	83.0	83.2	83.2	82.8	82.2	81.7	81.3	80.3	78.7	77.0	74.5	71.8
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	68.5	64.3	60.8	57.8	55.7	54.3	53.3	52.5	51.9	51.3	50.9	50.9	51.2	52.1	53.5	55.4	57.9	60.2	62.6	64.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	66.3	73.0	77.3	80.3	80.9	79.5	72.7	56.5	52.6	58.4	62.3	66.0	69.2	74.0	76.3	61.8	47.1	46.1	46.2	45.8
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	45.0	43.8	42.1	40.1	38.1	36.0	33.8	31.4	28.7	26.3	24.3	23.1	22.5	22.0	21.7	21.8	22.2	23.2	23.3	22.3
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	20.7	18.9	17.2	15.5	13.5	11.1	8.3	5.6	3.4	1.8	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.00 mm

V11

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.0	10.8	24.8	33.9	37.5	42.4	44.9	64.7	17.1	21.0	89.2	89.4	90.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	90.4	90.4	88.9	66.7	88.8	87.7	79.8	75.1	76.7	87.5	77.8	54.4	54.8	28.2	70.8	86.3	83.4	4.1	3.6	2.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	29.9	59.3	88.4	86.8	90.0	90.8	90.6	86.2	79.2	80.5	89.2	90.2	87.5	63.3	9.9	13.9	48.3	72.5	70.4	35.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.4	7.3	43.9	70.3	85.4	86.5	72.6	56.2	36.9	60.4	75.9	84.7	88.0	90.7	91.6	91.8	91.8	91.9	91.9	91.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	92.0	92.0	92.0	92.1	92.1	92.1	92.1	92.1	92.1	92.2	92.1	92.2	92.2	92.3	92.3	92.3				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.559	1.547	1.541	1.537	1.534	1.533	1.532
P	0.909	0.912	0.913	0.914	0.915	0.915	0.916

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

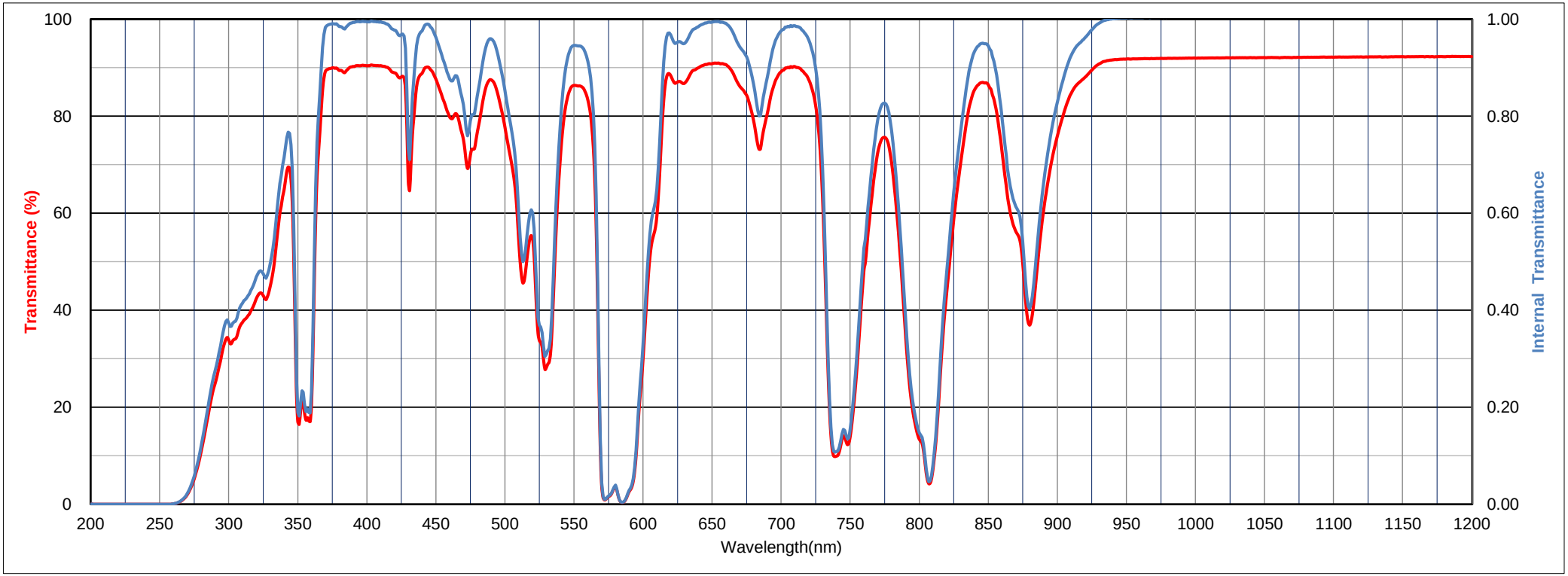
	x	y	Y	λ_d	P_e
A	-	-	-	-	-
C	-	-	-	-	-
D65	-	-	-	-	-

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
1	1	596	657	-	88	555	110	2.83

Tolerance of Transmittance (T)

Transmittance at 586nm
T586(%)
< 1%



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HOYA

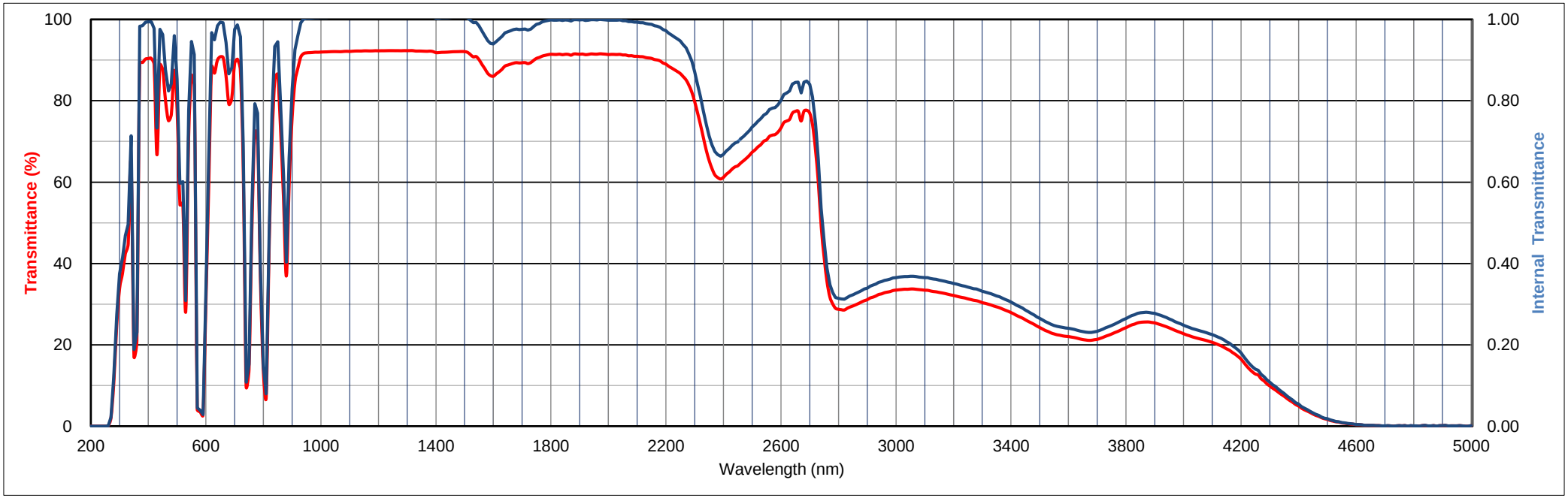
HOYA CORPORATION OPTICS SECTION

Thickness 2.00 mm

V11

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.0	10.8	24.8	33.9	37.5	42.4	44.9	64.7	17.1	21.0	89.2	89.4	90.3
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	90.4	90.4	88.9	66.7	88.8	87.7	79.8	75.1	76.7	87.5	77.8	54.4	54.8	28.2	70.8	86.3	83.4	4.1	3.6	2.6
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	29.9	59.3	88.4	86.8	90.0	90.8	90.6	86.2	79.2	80.5	89.2	90.2	87.5	63.3	9.9	13.9	48.3	72.5	70.4	35.4
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	13.4	7.3	43.9	70.3	85.4	86.5	72.6	56.2	36.9	60.4	75.9	84.7	88.0	90.7	91.6	91.8	91.8	91.9	91.9	91.9
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	92.0	92.0	92.0	92.1	92.1	92.1	92.1	92.1	92.1	92.2	92.1	92.2	92.2	92.2	92.2	92.3	92.3	92.3	92.3	92.3
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.3	92.2	92.2	92.2	92.2	92.2	92.2	92.1
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	91.8	91.8	91.9	91.9	92.0	92.0	92.1	92.1	92.1	92.1	92.1	91.9	91.4	90.8	90.9	90.1	89.0	87.9	86.8	86.2
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	86.0	86.6	87.1	87.7	88.5	88.8	89.0	89.2	89.4	89.3	89.3	89.4	89.1	89.4	89.9	90.4	90.7	91.0	91.2	91.3
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	91.4	91.4	91.4	91.5	91.3	91.4	91.4	91.2	91.5	91.5	91.4	91.5	91.3	91.4	91.5	91.5	91.5	91.5	91.5	91.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	91.4	91.3	90.9	90.4	89.0	86.7	79.8	65.4	61.2	64.0	67.4	70.4	73.3	77.4	77.0	41.6	28.7	29.5	31.1	32.5
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	33.5	33.7	33.4	32.9	32.1	31.3	30.4	29.3	27.9	26.2	24.3	22.7	22.0	21.3	21.4	22.7	24.2	25.5	25.4	24.2
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	22.7	21.6	20.6	19.0	16.5	12.8	9.9	7.4	5.0	3.0	1.7	0.8	0.4	0.2	0.0	0.1	0.1	0.0	0.1	0.1
λnm	5000																			
T	0.1																			



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HOYA

HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

HY1

Transmittance (T) units: %

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	1.7	11.5	23.9	44.8	71.2	81.0	85.5	86.1	84.7	84.6	36.3	83.2	87.6	87.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.2	88.0	71.4	87.5	78.2	38.1	17.1	81.7	85.8	81.8	89.4	89.2	89.2	85.0	68.9	83.6	89.5	89.7	89.7	89.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	89.5	89.5	89.0	85.5	75.1	78.4	83.8	88.7	89.5	89.8	89.8	89.8	89.7	89.7	89.6	89.7	89.6	89.5	89.5	89.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	89.7	89.7	89.8	90.0	89.8	89.9	89.7	89.7	89.0	89.3	89.7	89.5	89.6	90.2	90.2	90.3	90.4	90.4	90.4	90.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1120	1140	1160	1180	1200				
T	90.5	90.5	90.5	90.6	90.6	90.5	90.6	90.6	90.6	90.5	90.4	88.9	86.2	88.1	87.8	87.5				

Refractive Index/Absorption coefficient/Reflection coefficent

λnm	400	500	600	700	800	900	1000
n	1.517	1.511	1.509	1.508	1.508	1.507	1.507
P	0.919	0.920	0.921	0.921	0.921	0.921	0.921

Classes of Bubbles and Inclusions

Bubble Class
3

Color Specification

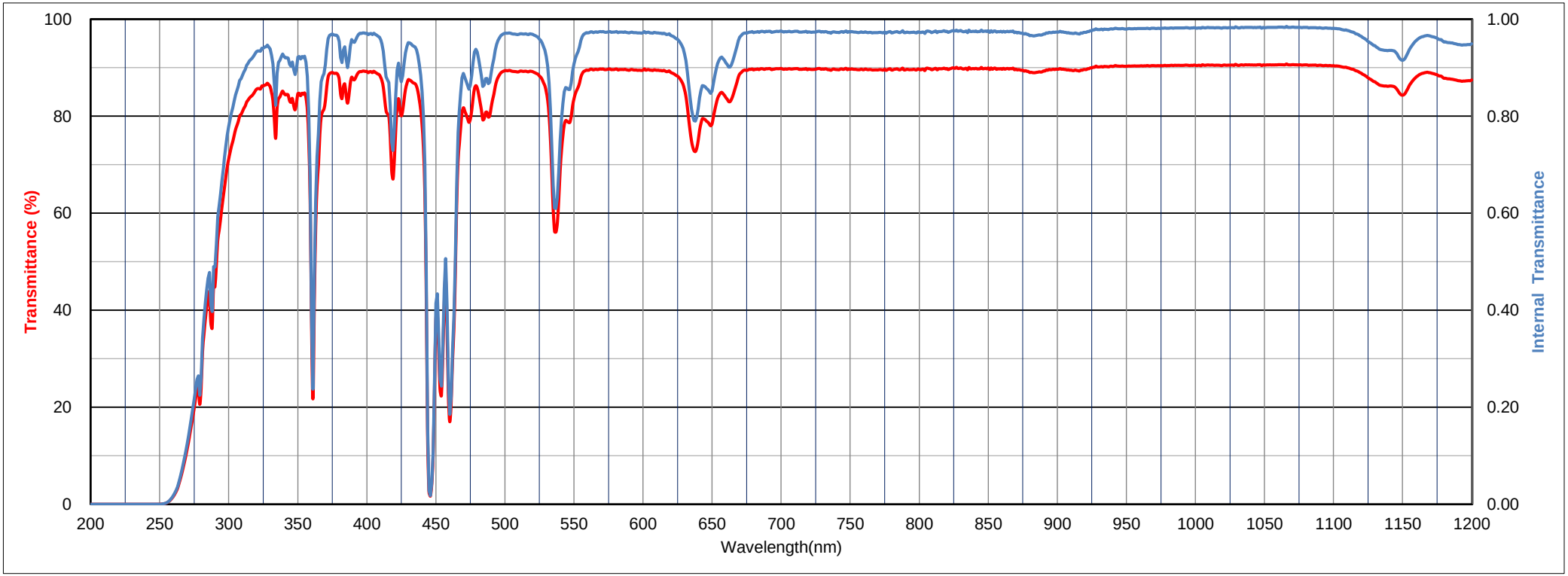
	x	y	Y	λ_d	P_e
A	0.465	0.425	86	581	24
C	0.337	0.360	85	572	19
D65	0.340	0.373	85	571	20

Properties

Chemical		Thermal				Mechanical		Others
D_W	D_A	Tg	Ts	α -30/70	α 100/300	H_K	F_A	d
4	1	590	640	102	116	520	130	3.19

Tolerance of Transmittance (T)

Transmittance at 435nm	Wavelength for Min. Transmittance
T435(%)	λ Tmin(nm)
>80	454±1



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HOYA

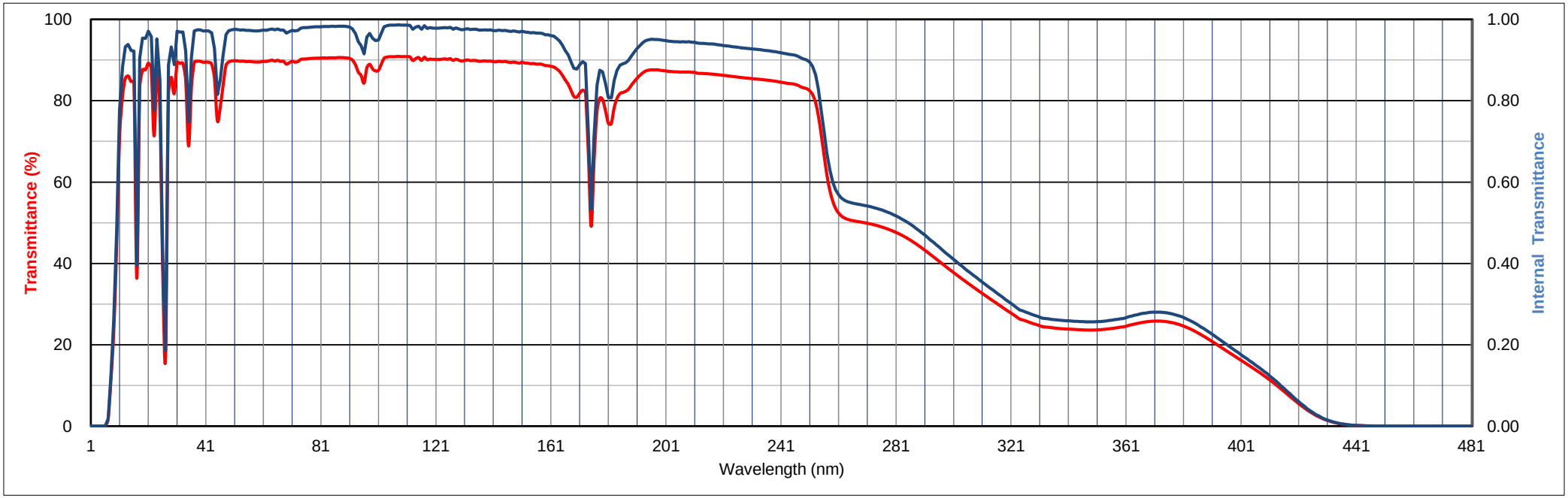
HOYA CORPORATION OPTICS SECTION

Thickness 2.50 mm

HY1

Transmittance (T) **units: %**

λnm	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390
T	0.0	0.0	0.0	0.0	0.0	0.0	1.7	11.5	23.9	44.8	71.2	81.0	85.5	86.1	84.7	84.6	36.3	83.2	87.6	87.6
λnm	400	410	420	430	440	450	460	470	480	490	500	510	520	530	540	550	560	570	580	590
T	89.2	88.0	71.4	87.5	78.2	38.1	17.1	81.7	85.8	81.8	89.4	89.2	89.2	85.0	68.9	83.6	89.5	89.7	89.7	89.5
λnm	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790
T	89.5	89.5	89.0	85.5	75.1	78.4	83.8	88.7	89.5	89.8	89.8	89.8	89.7	89.7	89.6	89.7	89.6	89.5	89.5	89.6
λnm	800	810	820	830	840	850	860	870	880	890	900	910	920	930	940	950	960	970	980	990
T	89.7	89.7	89.8	90.0	89.8	89.9	89.7	89.7	89.0	89.3	89.7	89.5	89.6	90.2	90.2	90.3	90.4	90.4	90.4	90.5
λnm	1000	1010	1020	1030	1040	1050	1060	1070	1080	1090	1100	1110	1120	1130	1140	1150	1160	1170	1180	1190
T	90.5	90.5	90.5	90.6	90.6	90.5	90.6	90.6	90.6	90.5	90.4	90.0	88.9	87.1	86.2	84.3	88.1	89.0	87.8	87.3
λnm	1200	1210	1220	1230	1240	1250	1260	1270	1280	1290	1300	1310	1320	1330	1340	1350	1360	1370	1380	1390
T	87.5	89.0	90.5	90.7	90.8	90.8	90.8	90.9	90.8	90.9	90.8	90.8	89.9	90.4	90.6	89.9	90.7	90.1	90.3	90.2
λnm	1400	1410	1420	1430	1440	1450	1460	1470	1480	1490	1500	1510	1520	1530	1540	1550	1560	1570	1580	1590
T	90.2	90.1	90.2	90.3	90.2	90.3	89.9	90.2	90.0	89.8	89.9	90.0	89.9	89.9	89.9	89.7	89.7	89.8	89.7	89.8
λnm	1600	1610	1620	1630	1640	1650	1660	1670	1680	1690	1700	1710	1720	1730	1740	1750	1760	1770	1780	1790
T	89.6	89.6	89.7	89.6	89.7	89.5	89.4	89.5	89.4	89.2	89.5	89.3	89.2	89.1	89.2	89.0	89.0	88.9	88.7	88.6
λnm	1800	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990
T	88.4	88.3	87.8	87.2	86.2	85.1	84.1	82.5	81.0	80.9	81.8	82.6	82.2	67.4	49.1	65.4	77.3	80.6	80.2	77.5
λnm	2000	2050	2100	2150	2200	2250	2300	2350	2400	2450	2500	2550	2600	2650	2700	2750	2800	2850	2900	2950
T	74.4	82.1	85.6	87.6	87.3	87.0	87.0	86.6	86.2	85.8	85.4	85.1	84.5	84.0	82.4	66.6	52.4	50.5	49.9	49.0
λnm	3000	3050	3100	3150	3200	3250	3300	3350	3400	3450	3500	3550	3600	3650	3700	3750	3800	3850	3900	3950
T	47.6	45.7	43.3	40.5	37.8	35.2	32.6	30.2	27.8	25.9	24.7	24.1	23.9	23.7	23.7	24.0	24.6	25.4	25.8	25.6
λnm	4000	4050	4100	4150	4200	4250	4300	4350	4400	4450	4500	4550	4600	4650	4700	4750	4800	4850	4900	4950
T	24.6	22.9	20.8	18.5	16.2	13.9	11.4	8.5	5.6	3.1	1.4	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
λnm	5000																			
T	0.0																			



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Standard Illuminant D65

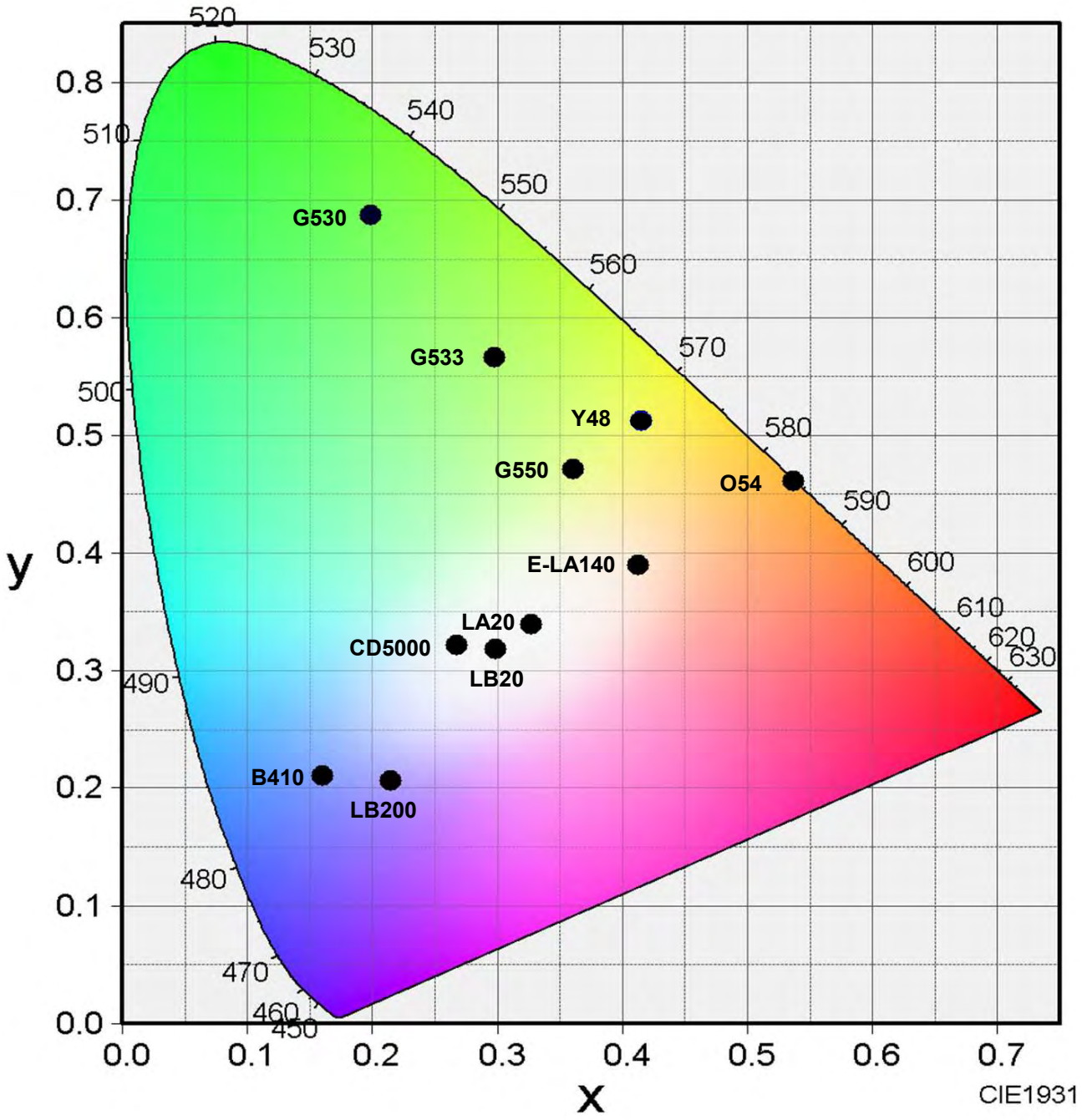
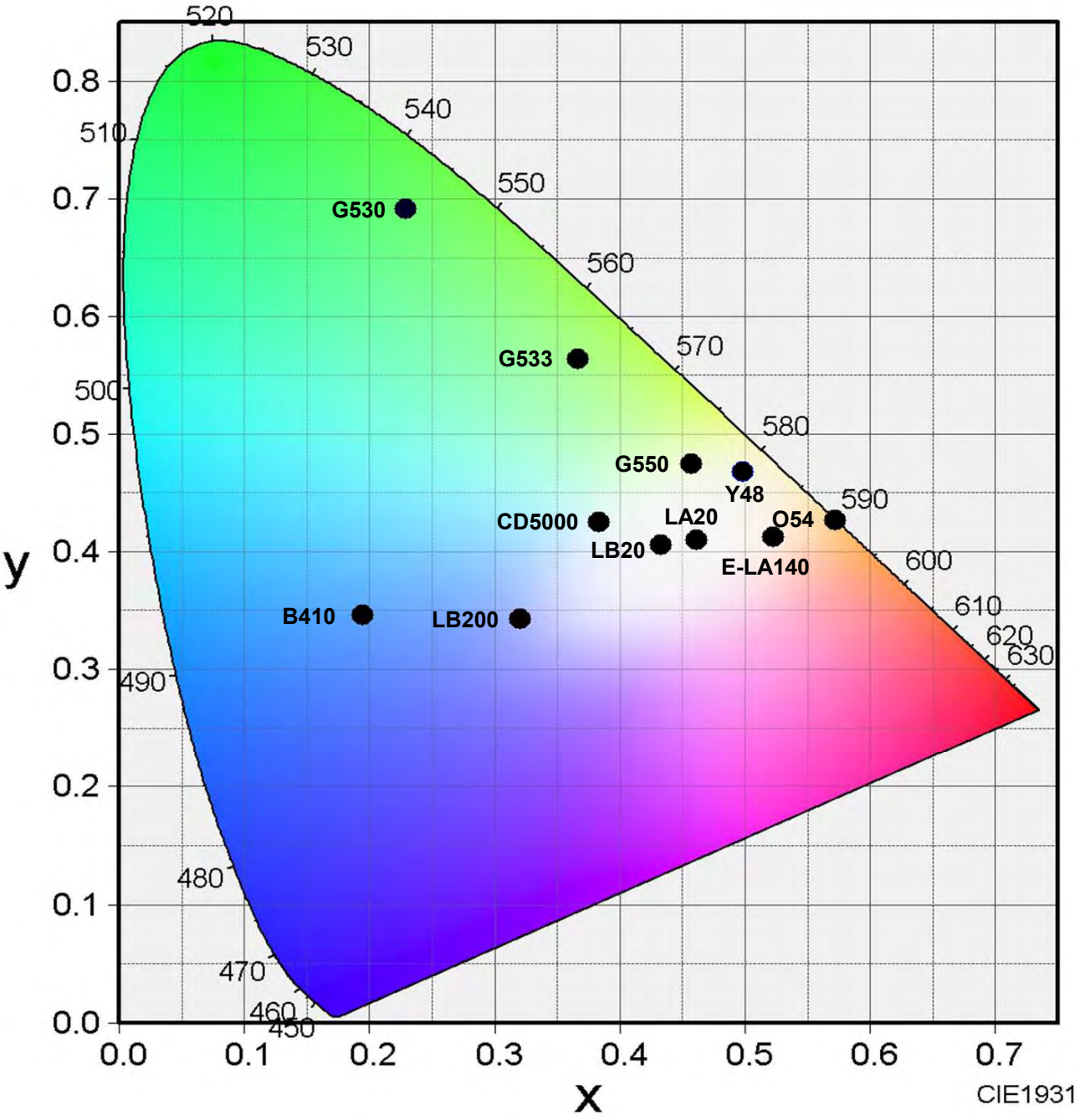
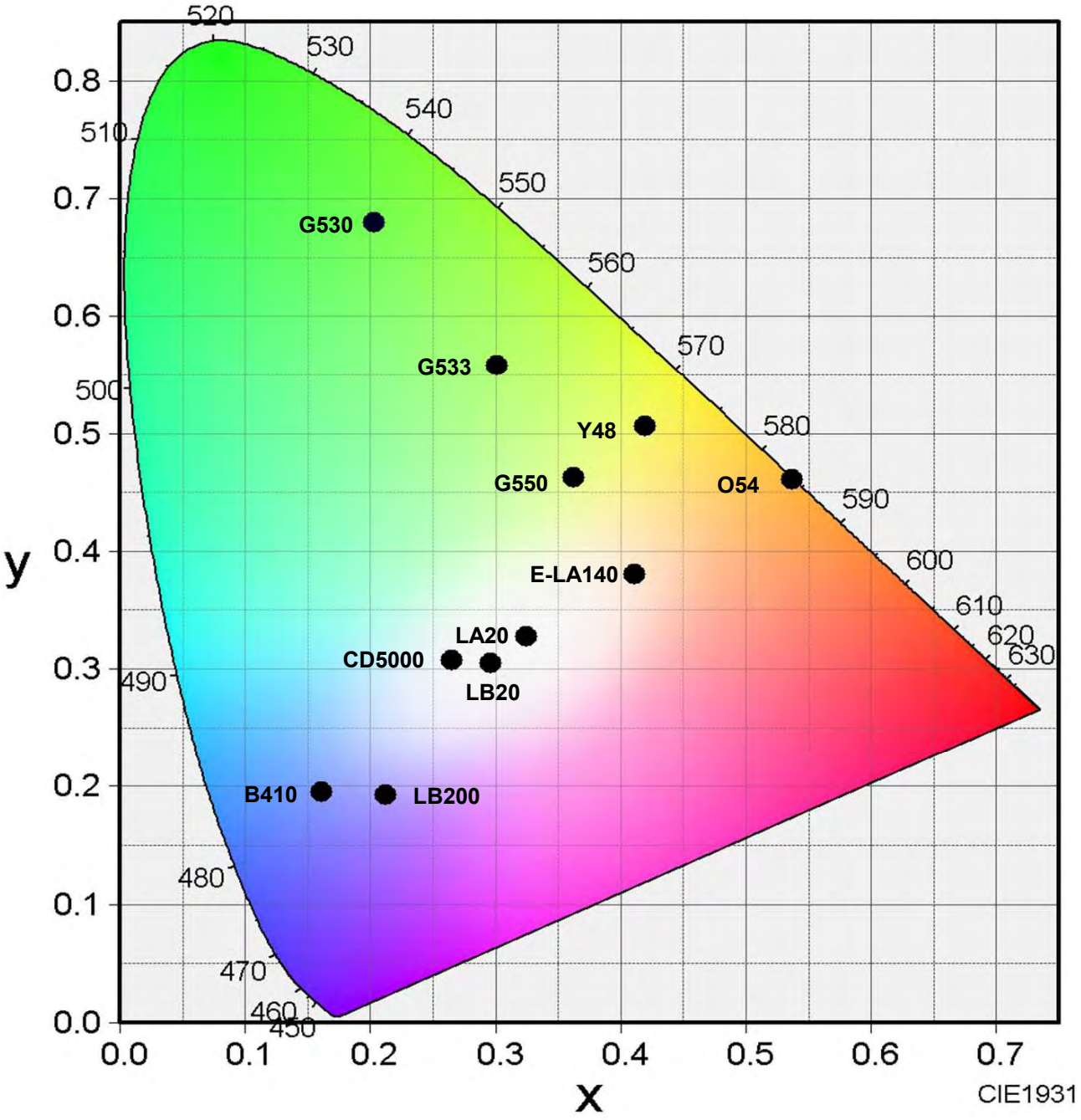


Diagram 1

Standard Illuminant A



Auxiliary Standard Illuminant C



Revision

April, 2014	First edition issued
July, 2015	Revision Issued List changes here (G530, G533 and HY1 data sheet updated)
December, 2017	Neutral Density Filters (W-ND) is added
April, 2019	Revision Issued CM5000,E-CM500S,CD5000,U325C/B and V30 are removed. CD700 and CM700 are added.
October, 2020	UV filters are added. UL254S is added. V11 is added.

Specifications subject to change without notice.