

S-PHM53

Code(d) 603655

Code(e) 605651

Refractive Index n_d	1.603 00 1.603 001	Abbe Number ν_d	65.44	Dispersion $n_F - n_C$	0.009 215
Refractive Index n_e	1.605 200	Abbe Number ν_e	65.15	Dispersion $n_{F'} - n_{C'}$	0.009 289

Refractive Indices		
λ (μm)		
n_{2325}	2.325 42	1.575 83
n_{1970}	1.970 09	1.580 92
n_{1530}	1.529 58	1.586 34
n_{1129}	1.128 64	1.591 03
n_t	1.013 98	1.592 56
n_s	0.852 11	1.595 19
$n_{A'}$	0.768 19	1.596 97
n_F	0.706 52	1.598 58
n_C	0.656 27	1.600 19
$n_{C'}$	0.643 85	1.600 64
n_{He-Ne}	0.632 8	1.601 06
n_D	0.589 29	1.602 92
n_d	0.587 56	1.603 00
n_e	0.546 07	1.605 20
n_F	0.486 13	1.609 40
$n_{F'}$	0.479 99	1.609 93
n_{He-Cd}	0.441 57	1.613 72
n_g	0.435 835	1.614 38
n_h	0.404 656	1.618 50
n_i	0.365 015	1.625 47

Constants of Dispersion Formula	
A_1	1.097 754 23E+00
A_2	4.348 164 32E-01
A_3	1.138 949 76E+00
B_1	1.233 694 00E-02
B_2	-3.725 229 03E-04
B_3	1.242 769 84E+02

Chemical Properties	
Water Resistance(Powder) Group RW(P)	1
Acid Resistance(Powder) Group RA(P)	5
Weathering Resistance(Surface) Group W(S)	1~2
Acid Resistance(Surface) Group SR	51.0
Phosphate Resistance PR	4.0

Mechanical Properties	
Young's Modulus E (GPa)	70.8
Rigidity Modulus G (GPa)	27.5
Poisson's Ratio σ	0.285
Knoop Hardness Hk[Class]	430 4
Abrasion Aa	407

Partial Dispersions	
$n_C - n_t$	0.007 630
$n_C - n_{A'}$	0.003 223
$n_d - n_C$	0.002 812
$n_e - n_C$	0.005 011
$n_g - n_d$	0.011 380
$n_g - n_F$	0.004 977
$n_h - n_g$	0.004 114
$n_i - n_g$	0.011 090
$n_{C'} - n_t$	0.008 078
$n_e - n_{C'}$	0.004 563
$n_{F'} - n_e$	0.004 726
$n_i - n_{F'}$	0.015 545

Relative Partial Dispersions	
$\theta_{C,t}$	0.828 0
$\theta_{C,A'}$	0.349 8
$\theta_{d,C}$	0.305 2
$\theta_{e,C}$	0.543 8
$\theta_{g,d}$	1.234 9
$\theta_{g,F}$	0.540 1
$\theta_{h,g}$	0.446 4
$\theta_{i,g}$	1.203 5
$\theta'_{C,t}$	0.869 6
$\theta'_{e,C'}$	0.491 2
$\theta'_{F',e}$	0.508 8
$\theta'_{i,F'}$	1.673 5

Anomalous dispersion	
$\Delta\theta_{C,t}$	-0.025 7
$\Delta\theta_{C,A'}$	-0.005 4
$\Delta\theta_{g,d}$	0.006 1
$\Delta\theta_{g,F}$	0.004 5
$\Delta\theta_{i,g}$	0.026 5

Coloring			
λ_{80}	360	λ_5	300
λ_{70}			
Internal transmission			
$\lambda_{0.80}$	362	$\lambda_{0.05}$	313
CCI			
B	G	R	
0.00	0.56	0.52	

Internal Transmittance	
λ (nm)	τ_i (10 mm)
280	
290	
300	
310	0.03
320	0.10
330	0.25
340	0.45
350	0.64
360	0.78
370	0.88
380	0.935
390	0.963
400	0.977
420	0.986
440	0.987
460	0.989
480	0.992
500	0.994
550	0.998
600	0.997
650	0.996
700	0.996
800	0.997
900	0.997
1 000	0.996
1 200	0.997
1 400	0.993
1 600	0.987
1 800	0.967
2 000	0.941
2 200	0.87
2 400	0.83

Thermal Properties	
Strain Point StP (°C)	-
Annealing Point AP (°C)	-
Transformation Temperature Tg (°C)	619
Yield Point At (°C)	650
Softening Point SP (°C)	681
Expansion Coefficients (-30 °C ~ 70 °C)	95
α_i (10 ⁻⁷ K ⁻¹) (100 °C ~ 300 °C)	113
Thermal Conductivity λ (W/(m·K))	0.615

Linear coefficient of thermal expansion	
Temperature range (°C)	α_i (10 ⁻⁷ K ⁻¹)
-100 ~ -90	79
-90 ~ -80	81
-80 ~ -70	82
-70 ~ -60	84
-60 ~ -50	85
-50 ~ -40	87
-40 ~ -30	88
-30 ~ -20	90
-20 ~ -10	91
-10 ~ 0	92
0 ~ 10	94
10 ~ 20	95
20 ~ 30	96
30 ~ 40	97
40 ~ 50	98
50 ~ 60	100
60 ~ 70	101
70 ~ 80	102
80 ~ 90	103
90 ~ 100	104
100 ~ 110	105
110 ~ 120	106
120 ~ 130	107
130 ~ 140	108
140 ~ 150	109
150 ~ 160	110
160 ~ 170	111
170 ~ 180	111
180 ~ 190	112
190 ~ 200	113
200 ~ 210	114
210 ~ 220	114
220 ~ 230	115
230 ~ 240	116
240 ~ 250	116
250 ~ 260	117
260 ~ 270	118
270 ~ 280	118
280 ~ 290	119
290 ~ 300	119

Other Properties	
Photoelastic Constant β nm/(cm ³ ·105Pa)	1.21
Specific Gravity d	3.51
Remarks	

Temperature Coefficients of Refractive Index												
Range of Temperature (°C)	$\Delta n_{rel} / \Delta T$ (10 ⁻⁶ K ⁻¹)											
	1550	t	r	C	C'	d	e	F	F'	g	h	i
-80 ~ -60	-3.3	-3.2	-3.1	-3.1	-3.1	-3.0	-3.0	-2.7	-2.7	-2.5	-2.4	-1.9
-60 ~ -40	-3.4	-3.4	-3.2	-3.1	-3.1	-3.0	-3.0	-2.8	-2.8	-2.6	-2.3	-2.0
-40 ~ -20	-3.4	-3.4	-3.2	-3.1	-3.1	-3.0	-3.0	-2.8	-2.8	-2.6	-2.4	-1.9
-20 ~ 0	-3.4	-3.3	-3.2	-3.1	-3.0	-3.0	-2.9	-2.7	-2.7	-2.5	-2.3	-1.9
0 ~ 20	-3.2	-3.2	-3.1	-3.0	-3.0	-2.9	-2.8	-2.7	-2.6	-2.4	-2.2	-1.7
20 ~ 40	-3.2	-3.1	-3.0	-2.9	-2.9	-2.8	-2.7	-2.6	-2.5	-2.3	-2.1	-1.6
40 ~ 60	-3.1	-3.1	-2.9	-2.9	-2.8	-2.8	-2.7	-2.5	-2.5	-2.1	-1.9	-1.5
60 ~ 80	-3.0	-3.0	-2.8	-2.7	-2.7	-2.6	-2.5	-2.4	-2.3	-2.1	-1.9	-1.4
80 ~ 100	-2.9	-2.9	-2.7	-2.6	-2.6	-2.5	-2.4	-2.2	-2.2	-2.0	-1.7	-1.3
100 ~ 120	-2.9	-2.8	-2.7	-2.6	-2.6	-2.5	-2.4	-2.2	-2.2	-1.9	-1.7	-1.2
120 ~ 140	-2.9	-2.8	-2.7	-2.6	-2.6	-2.5	-2.4	-2.2	-2.1	-1.9	-1.6	-1.1
140 ~ 160	-3.0	-2.9	-2.7	-2.6	-2.6	-2.5	-2.4	-2.2	-2.2	-1.9	-1.6	-1.0
160 ~ 180	-3.0	-2.8	-2.8	-2.6	-2.6	-2.5	-2.4	-2.1	-2.1	-1.8	-1.6	-1.0

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