

S-FPM 4

Code(d) 528765

Code(e) 530760

Refractive Index n_d	1.528 41 1.528 410	Abbe Number ν_d	76.46	Dispersion $n_F - n_C$	0.006 911
Refractive Index n_e	1.530 060	Abbe Number ν_e	76.07	Dispersion $n_{F'} - n_{C'}$	0.006 968

Refractive Indices		
λ (μm)		
n_{2325}	2.325 42	1.509 11
n_{1970}	1.970 09	1.512 54
n_{1530}	1.529 58	1.516 25
n_{1129}	1.128 64	1.519 55
n_t	1.013 98	1.520 65
n_s	0.852 11	1.522 58
$n_{A'}$	0.768 19	1.523 90
n_F	0.706 52	1.525 10
n_C	0.656 27	1.526 30
$n_{C'}$	0.643 85	1.526 64
n_{He-Ne}	0.632 8	1.526 95
n_D	0.589 29	1.528 35
n_d	0.587 56	1.528 41
n_e	0.546 07	1.530 06
n_F	0.486 13	1.533 21
$n_{F'}$	0.479 99	1.533 61
n_{He-Cd}	0.441 57	1.536 45
n_g	0.435 835	1.536 94
n_h	0.404 656	1.540 02
n_i	0.365 015	1.545 22

Constants of Dispersion Formula	
A_1	6.855 850 84E-01
A_2	6.233 802 15E-01
A_3	9.141 783 86E-01
B_1	2.881 720 10E-03
B_2	1.247 017 07E-02
B_3	1.535 772 00E+02

Chemical Properties	
Water Resistance(Powder) Group RW(P)	1
Acid Resistance(Powder) Group RA(P)	3
Weathering Resistance(Surface) Group W(S)	1
Acid Resistance(Surface) Group SR	51.3
Phosphate Resistance PR	4.3

Mechanical Properties		
Young's Modulus E (GPa)	74.7	
Rigidity Modulus G (GPa)	28.9	
Poisson's Ratio σ	0.295	
Knoop Hardness Hk[Class]	380	4
Abrasion Aa	506	

Partial Dispersions	
$n_C - n_t$	0.005 650
$n_C - n_{A'}$	0.002 406
$n_d - n_C$	0.002 107
$n_e - n_C$	0.003 757
$n_g - n_d$	0.008 533
$n_g - n_F$	0.003 729
$n_h - n_g$	0.003 076
$n_i - n_g$	0.008 275
$n_{C'} - n_t$	0.005 985
$n_e - n_{C'}$	0.003 422
$n_{F'} - n_e$	0.003 546
$n_i - n_{F'}$	0.011 612

Relative Partial Dispersions	
$\theta_{C,t}$	0.817 5
$\theta_{C,A'}$	0.348 1
$\theta_{d,C}$	0.304 9
$\theta_{e,C}$	0.543 6
$\theta_{g,d}$	1.234 7
$\theta_{g,F}$	0.539 6
$\theta_{h,g}$	0.445 1
$\theta_{i,g}$	1.197 4
$\theta'_{C,t}$	0.858 9
$\theta'_{e,C'}$	0.491 1
$\theta'_{F',e}$	0.508 9
$\theta'_{i,F'}$	1.666 5

Anomalous dispersion	
$\Delta\theta_{C,t}$	-0.087 9
$\Delta\theta_{C,A'}$	-0.020 5
$\Delta\theta_{g,d}$	0.028 8
$\Delta\theta_{g,F}$	0.021 8
$\Delta\theta_{i,g}$	0.112 6

Coloring			
λ_{80}	340	λ_5	
λ_{70}			
Internal transmission			
$\lambda_{0.80}$	335	$\lambda_{0.05}$	283
CCI			
B	G	R	
0.00	0.14	0.11	

Internal Transmittance	
λ (nm)	τ_i (10 mm)
280	0.03
290	0.09
300	0.20
310	0.37
320	0.58
330	0.75
340	0.86
350	0.934
360	0.968
370	0.984
380	0.992
390	0.995
400	0.996
420	0.995
440	0.995
460	0.996
480	0.997
500	0.998
550	0.999
600	0.998
650	0.998
700	0.997
800	0.997
900	0.997
1 000	0.997
1 200	0.998
1 400	0.999
1 600	0.998
1 800	0.998
2 000	0.998
2 200	0.996
2 400	0.995

Thermal Properties	
Strain Point StP (°C)	-
Annealing Point AP (°C)	-
Transformation Temperature Tg (°C)	487
Yield Point At (°C)	515
Softening Point SP (°C)	-
Expansion Coefficients (-30 °C ~ 70 °C)	125
α_i (10 ⁻⁷ K ⁻¹) (100 °C ~ 300 °C)	148
Thermal Conductivity λ (W/(mK))	0.746

Linear coefficient of thermal expansion	
Temperature range (°C)	α_i (10 ⁻⁷ K ⁻¹)
-100 ~ -90	104
-90 ~ -80	106
-80 ~ -70	108
-70 ~ -60	110
-60 ~ -50	112
-50 ~ -40	114
-40 ~ -30	116
-30 ~ -20	117
-20 ~ -10	119
-10 ~ 0	121
0 ~ 10	122
10 ~ 20	124
20 ~ 30	126
30 ~ 40	127
40 ~ 50	129
50 ~ 60	130
60 ~ 70	132
70 ~ 80	133
80 ~ 90	135
90 ~ 100	136
100 ~ 110	137
110 ~ 120	139
120 ~ 130	140
130 ~ 140	141
140 ~ 150	142
150 ~ 160	144
160 ~ 170	145
170 ~ 180	146
180 ~ 190	147
190 ~ 200	148
200 ~ 210	149
210 ~ 220	150
220 ~ 230	151
230 ~ 240	152
240 ~ 250	153
250 ~ 260	154
260 ~ 270	154
270 ~ 280	155
280 ~ 290	156
290 ~ 300	157

Other Properties	
Photoelastic Constant β nm/(cm ³ 105Pa)	0.72
Specific Gravity d	3.76
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	-5.1	-5.1	-4.9	-4.8	-4.8	-4.8	-4.7	-4.6	-4.6	-4.5	-4.3	-4.1
-60 ~ -40	-5.5	-5.4	-5.3	-5.2	-5.2	-5.1	-5.1	-5.0	-4.9	-4.8	-4.7	-4.3
-40 ~ -20	-5.8	-5.7	-5.5	-5.5	-5.5	-5.4	-5.3	-5.2	-5.2	-5.1	-4.9	-4.6
-20 ~ 0	-5.9	-5.9	-5.7	-5.6	-5.6	-5.6	-5.5	-5.4	-5.3	-5.2	-5.0	-4.8
0 ~ 20	-6.0	-6.0	-5.9	-5.8	-5.8	-5.7	-5.7	-5.5	-5.5	-5.2	-5.1	-4.8
20 ~ 40	-6.2	-6.1	-6.0	-5.9	-5.9	-5.8	-5.8	-5.5	-5.5	-5.3	-5.2	-4.9
40 ~ 60	-6.2	-6.1	-6.0	-5.9	-5.9	-5.8	-5.8	-5.6	-5.6	-5.4	-5.2	-4.9
60 ~ 80	-6.3	-6.2	-6.1	-6.0	-6.0	-5.9	-5.8	-5.7	-5.6	-5.4	-5.2	-4.8
80 ~ 100	-6.3	-6.3	-6.1	-6.1	-6.0	-6.0	-5.9	-5.7	-5.7	-5.4	-5.2	-4.8
100 ~ 120	-6.4	-6.3	-6.1	-6.1	-6.1	-6.0	-5.9	-5.7	-5.7	-5.5	-5.2	-4.8
120 ~ 140	-6.4	-6.4	-6.1	-6.1	-6.1	-5.9	-5.9	-5.6	-5.6	-5.4	-5.2	-4.8
140 ~ 160	-6.4	-6.3	-6.1	-6.1	-6.1	-6.0	-5.8	-5.6	-5.6	-5.4	-5.2	-4.8
160 ~ 180	-6.5	-6.4	-6.2	-6.1	-6.1	-6.0	-5.9	-5.7	-5.6	-5.4	-5.2	-4.8

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