

S-NPH 3

Code(d) 959175

Code(e) 972173

Refractive Index n_d	1.959 06 1.959 060	Abbe Number ν_d	17.47	Dispersion $n_F - n_C$	0.054 895
Refractive Index n_e	1.971 885	Abbe Number ν_e	17.33	Dispersion $n_{F'} - n_{C'}$	0.056 091

Refractive Indices		
λ (μm)		
n_{2325}	2.325 42	1.870 64
n_{1970}	1.970 09	1.880 02
n_{1530}	1.529 58	1.891 31
n_{1129}	1.128 64	1.904 12
n_t	1.013 98	1.909 37
n_s	0.852 11	1.919 84
$n_{A'}$	0.768 19	1.927 80
n_F	0.706 52	1.935 59
n_C	0.656 27	1.943 76
$n_{C'}$	0.643 85	1.946 12
n_{He-Ne}	0.632 8	1.948 34
n_D	0.589 29	1.958 60
n_d	0.587 56	1.959 06
n_e	0.546 07	1.971 88
n_F	0.486 13	1.998 66
$n_{F'}$	0.479 99	2.002 21
n_{He-Cd}	0.441 57	2.029 76
n_g	0.435 835	2.034 88
n_h	0.404 656	2.069 65
n_i	0.365 015	

Constants of Dispersion Formula	
A_1	2.098 349 03E+00
A_2	4.890 883 88E-01
A_3	2.940 092 68E+00
B_1	1.791 238 69E-02
B_2	7.766 533 53E-02
B_3	1.609 304 28E+02

Chemical Properties	
Water Resistance(Powder) Group RW(P)	1
Acid Resistance(Powder) Group RA(P)	1
Weathering Resistance(Surface) Group W(S)	1
Acid Resistance(Surface) Group SR	1.0
Phosphate Resistance PR	1.0

Mechanical Properties	
Young's Modulus E (GPa)	102.2
Rigidity Modulus G (GPa)	41.1
Poisson's Ratio σ	0.243
Knoop Hardness Hk[Class]	500 5
Abrasion Aa	215

Partial Dispersions	
$n_C - n_t$	0.034 388
$n_C - n_{A'}$	0.015 956
$n_d - n_C$	0.015 300
$n_e - n_C$	0.028 125
$n_g - n_d$	0.075 817
$n_g - n_F$	0.036 222
$n_h - n_g$	0.034 773
$n_i - n_g$	
$n_C - n_t$	0.036 744
$n_e - n_{C'}$	0.025 769
$n_{F'} - n_e$	0.030 322
$n_i - n_{F'}$	

Relative Partial Dispersions	
$\theta_{C,t}$	0.626 4
$\theta_{C,A'}$	0.290 7
$\theta_{d,C}$	0.278 7
$\theta_{e,C}$	0.512 3
$\theta_{g,d}$	1.381 1
$\theta_{g,F}$	0.659 8
$\theta_{h,g}$	0.633 4
$\theta_{i,g}$	
$\theta'_{C,t}$	0.655 1
$\theta'_{e,C'}$	0.459 4
$\theta'_{F,e}$	0.540 6
$\theta'_{i,F'}$	

Anomalous dispersion	
$\Delta\theta_{C,t}$	-0.002 2
$\Delta\theta_{C,A'}$	-0.006 3
$\Delta\theta_{g,d}$	0.052 7
$\Delta\theta_{g,F}$	0.046 6
$\Delta\theta_{i,g}$	

Coloring			
λ_{80}		λ_5	395
λ_{70}	440		
Internal transmission			
$\lambda_{0.80}$	430	$\lambda_{0.05}$	398
CCI			
B	G	R	
0.00	13.14	13.56	

Internal Transmittance	
λ (nm)	τ_i (10 mm)
280	
290	
300	
310	
320	
330	
340	
350	
360	
370	
380	
390	
400	0.12
420	0.72
440	0.88
460	0.932
480	0.956
500	0.970
550	0.990
600	0.996
650	0.997
700	0.999
800	0.999
900	0.998
1 000	0.998
1 200	0.999
1 400	0.998
1 600	0.995
1 800	0.989
2 000	0.983
2 200	0.968
2 400	0.949

Thermal Properties	
Strain Point StP (°C)	-
Annealing Point AP (°C)	-
Transformation Temperature Tg (°C)	672
Yield Point At (°C)	707
Softening Point SP (°C)	-
Expansion Coefficients (-30 °C ~ 70 °C)	59
α_i (10 ⁻⁷ K ⁻¹) (100 °C ~ 300 °C)	72
Thermal Conductivity λ (W/(mK))	1.01

Linear coefficient of thermal expansion	
Temperature range (°C)	α_i (10 ⁻⁷ K ⁻¹)
-100 ~ -90	46
-90 ~ -80	47
-80 ~ -70	48
-70 ~ -60	50
-60 ~ -50	51
-50 ~ -40	52
-40 ~ -30	53
-30 ~ -20	54
-20 ~ -10	55
-10 ~ 0	56
0 ~ 10	57
10 ~ 20	58
20 ~ 30	59
30 ~ 40	60
40 ~ 50	61
50 ~ 60	62
60 ~ 70	63
70 ~ 80	63
80 ~ 90	64
90 ~ 100	65
100 ~ 110	66
110 ~ 120	67
120 ~ 130	68
130 ~ 140	68
140 ~ 150	69
150 ~ 160	70
160 ~ 170	71
170 ~ 180	71
180 ~ 190	72
190 ~ 200	73
200 ~ 210	73
210 ~ 220	74
220 ~ 230	74
230 ~ 240	75
240 ~ 250	76
250 ~ 260	76
260 ~ 270	77
270 ~ 280	77
280 ~ 290	78
290 ~ 300	78

Other Properties	
Photoelastic Constant β nm/(cm ³ 105Pa)	3.35
Specific Gravity d	3.59
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	-1.3	-0.9	-0.1	0.3	0.4	1.0	1.6	3.4	3.7	6.7	11.3	-
-60 ~ -40	-1.1	-0.8	0.2	0.5	0.6	1.4	2.1	4.0	4.3	7.4	12.4	-
-40 ~ -20	-0.9	-0.4	0.5	0.9	1.0	1.8	2.6	4.5	4.8	8.3	13.7	-
-20 ~ 0	-0.6	-0.1	0.9	1.3	1.4	2.3	3.1	5.2	5.5	9.2	14.8	-
0 ~ 20	-0.3	0.2	1.3	1.8	1.9	2.8	3.7	5.9	6.2	10.2	16.1	-
20 ~ 40	0.0	0.5	1.8	2.2	2.4	3.2	4.1	6.6	7.0	11.1	17.3	-
40 ~ 60	0.3	0.9	2.2	2.7	2.8	3.7	4.7	7.2	7.7	12.0	18.6	-
60 ~ 80	0.6	1.1	2.5	3.0	3.2	4.1	5.2	7.9	8.3	12.8	19.7	-
80 ~ 100	0.7	1.3	2.8	3.4	3.6	4.5	5.6	8.4	8.8	13.7	21.0	-
100 ~ 120	0.9	1.5	3.0	3.7	3.9	4.9	6.1	9.0	9.4	14.4	22.0	-
120 ~ 140	1.0	1.7	3.4	4.0	4.1	5.2	6.4	9.5	9.9	15.1	23.1	-
140 ~ 160	1.1	1.8	3.5	4.2	4.3	5.4	6.7	9.9	10.4	15.8	24.0	-
160 ~ 180	1.2	1.9	3.6	4.3	4.5	5.6	6.9	10.2	10.7	16.4	25.1	-

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