S-NPH 5

Code(d) **859227**
Code(e) **868225**

Refractive Index	n_d	**1.858 96** 1.858 956	Abbe Number	ν_d	**22.73**	Dispersion	$n_F - n_C$ **0.037 792**
Refractive Index	n_e	1.867 836	Abbe Number	ν_e	22.54	Dispersion	$n_{F'} - n_{C'}$ 0.038 499

Refractive Indices		
λ (μm)		
n_{2325}	2.325 42	1.792 47
n_{1970}	1.970 09	1.800 27
n_{1530}	1.529 58	1.809 44
n_{1129}	1.128 64	1.819 38
n_t	1.013 98	1.823 33
n_s	0.852 11	1.831 03
$n_{A'}$	0.768 19	1.836 81
n_r	0.706 52	1.842 40
n_C	0.656 27	1.848 21
$n_{C'}$	0.643 85	1.849 87
$n_{He\text{-}Ne}$	0.632 8	1.851 45
n_D	0.589 29	1.858 63
n_d	0.587 56	1.858 96
n_e	0.546 07	1.867 84
n_F	0.486 13	1.886 00
$n_{F'}$	0.479 99	1.888 37
$n_{He\text{-}Cd}$	0.441 57	1.906 45
n_g	0.435 835	1.909 75
n_h	0.404 656	1.931 60
n_i	0.365 015	

Constants of Dispersion Formula	
A_1	1.891 089 96E+00
A_2	3.952 201 26E-01
A_3	2.204 921 27E+00
B_1	1.411 644 99E-02
B_2	6.628 344 45E-02
B_3	1.486 807 00E+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)	92.9	
Rigidity Modulus G (GPa)	37.0	
Poisson's Ratio σ	0.256	
Knoop Hardness Hk[Class]	460	5
Abrasion Aa	277	

Partial Dispersions	
$n_C - n_t$	0.024 883
$n_C - n_{A'}$	0.011 397
$n_d - n_C$	0.010 747
$n_e - n_C$	0.019 627
$n_g - n_d$	0.050 792
$n_g - n_F$	0.023 747
$n_h - n_g$	0.021 851
$n_i - n_g$	
$n_{C'} - n_t$	0.026 548
$n_e - n_{C'}$	0.017 962
$n_{F'} - n_e$	0.020 537
$n_i - n_{F'}$	

Relative Partial Dispersions	
$\theta_{C,t}$	0.658 4
$\theta_{C,A'}$	0.301 6
$\theta_{d,C}$	0.284 4
$\theta_{e,C}$	0.519 3
$\theta_{g,d}$	1.344 0
$\theta_{g,F}$	0.628 4
$\theta_{h,g}$	0.578 2
$\theta_{i,g}$	
$\theta'_{C',t}$	0.689 6
$\theta'_{e,C'}$	0.466 6
$\theta'_{F',e}$	0.533 4
$\theta'_{i,F'}$	

Anomalous dispersion	
$\Delta\theta_{C,t}$	0.005 1
$\Delta\theta_{C,A'}$	-0.001 8
$\Delta\theta_{g,d}$	0.026 5
$\Delta\theta_{g,F}$	0.023 7
$\Delta\theta_{i,g}$	

Coloring			
λ_{80}		λ_5	370
λ_{70}	400		

Internal transmission			
$\lambda_{0.80}$	397	$\lambda_{0.05}$	364

CCI		
B	G	R
0.00	3.38	3.62

Internal Transmittance	
λ (nm)	τ_i (10 mm)
280	
290	
300	
310	
320	
330	
340	
350	
360	0.03
370	0.08
380	0.41
390	0.72
400	0.84
420	0.924
440	0.949
460	0.962
480	0.971
500	0.979
550	0.991
600	0.994
650	0.995
700	0.996
800	0.998
900	0.998
1 000	0.998
1 200	0.999
1 400	0.996
1 600	0.993
1 800	0.984
2 000	0.972
2 200	0.944
2 400	0.915

Thermal Properties		
Strain Point StP (°C)		573
Annealing Point AP (°C)		599
Transformation Temperature Tg (°C)		619
Yield Point At (°C)		662
Softening Point SP (°C)		704
Expansion Coefficients	(-30 ℃ ~ 70 ℃)	69
α_l (10^{-7} K^{-1})	(100 °C ~ 300 °C)	86
Thermal Conductivity λ (W/(m·K))		0.877

Linear coefficient of thermal expansion	
Temperature range (°C)	α_l (10^{-7} K^{-1})
-100 ~ -90	57
-90 ~ -80	59
-80 ~ -70	60
-70 ~ -60	61
-60 ~ -50	62
-50 ~ -40	63
-40 ~ -30	64
-30 ~ -20	66
-20 ~ -10	67
-10 ~ 0	68
0 ~ 10	69
10 ~ 20	70
20 ~ 30	71
30 ~ 40	72
40 ~ 50	73
50 ~ 60	74
60 ~ 70	75
70 ~ 80	76
80 ~ 90	77
90 ~ 100	78
100 ~ 110	79
110 ~ 120	80
120 ~ 130	81
130 ~ 140	82
140 ~ 150	82
150 ~ 160	83
160 ~ 170	84
170 ~ 180	85
180 ~ 190	86
190 ~ 200	86
200 ~ 210	87
210 ~ 220	88
220 ~ 230	89
230 ~ 240	89
240 ~ 250	90
250 ~ 260	91
260 ~ 270	91
270 ~ 280	92
280 ~ 290	93
290 ~ 300	93

Other Properties	
Photoelastic Constant β nm/(cm·105Pa)	3.18
Specific Gravity d	3.71
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	-1.5	-1.3	-0.6	-0.4	-0.4	0.0	0.4	1.5	1.7	3.4	5.6	-
-60 ~ -40	-1.4	-1.2	-0.5	-0.3	-0.2	0.2	0.6	1.8	1.9	3.7	6.1	-
-40 ~ -20	-1.4	-1.0	-0.4	-0.2	-0.1	0.3	0.8	2.1	2.2	4.1	6.7	-
-20 ~ 0	-1.2	-0.9	-0.2	0.0	0.1	0.7	1.2	2.4	2.6	4.5	7.3	-
0 ~ 20	-1.0	-0.7	0.0	0.4	0.4	1.0	1.5	2.8	3.0	5.1	8.0	-
20 ~ 40	-0.8	-0.5	0.3	0.6	0.7	1.2	1.8	3.2	3.4	5.6	8.6	-
40 ~ 60	-0.6	-0.3	0.5	0.8	0.9	1.5	2.1	3.6	3.8	6.1	9.2	-
60 ~ 80	-0.5	-0.2	0.8	1.0	1.1	1.8	2.4	3.9	4.1	6.5	9.8	-
80 ~ 100	-0.4	0.0	0.9	1.2	1.3	1.9	2.6	4.3	4.5	7.0	10.4	-
100 ~ 120	-0.3	0.1	1.1	1.4	1.5	2.1	2.8	4.5	4.7	7.4	11.0	-
120 ~ 140	-0.2	0.2	1.2	1.5	1.6	2.3	3.0	4.7	5.0	7.8	11.4	-
140 ~ 160	-0.2	0.2	1.2	1.6	1.7	2.4	3.1	5.0	5.3	8.1	11.9	-
160 ~ 180	-0.3	0.2	1.2	1.7	1.8	2.5	3.3	5.1	5.4	8.3	12.3	-

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※The name of the glass type is the model number assigned based on the main components of the composition: large, medium, small refractive index and serial number.