

|                  |               |                 |               |                        |
|------------------|---------------|-----------------|---------------|------------------------|
| <b>H-ZLaF77A</b> | <b>954323</b> | $n_d = 1.95375$ | $v_d = 32.32$ | $n_F - n_C = 0.029506$ |
|                  |               | $n_e = 1.96073$ | $v_e = 32.09$ | $n_F - n_C = 0.029940$ |

| Refractive Indices |                |             |
|--------------------|----------------|-------------|
|                    | $\lambda$ (nm) | $n_\lambda$ |
| $n_{2325}$         | 2325.42        | 1.89738     |
| $n_{1970}$         | 1970.09        | 1.90433     |
| $n_{1530}$         | 1529.58        | 1.91250     |
| $n_{1129}$         | 1128.64        | 1.92116     |
| $n_{1064}$         | 1064.00        | 1.92298     |
| $n_t$              | 1013.98        | 1.92453     |
| $n_s$              | 852.11         | 1.93102     |
| $n_{A'}$           | 768.19         | 1.93582     |
| $n_f$              | 706.52         | 1.94042     |
| $n_C$              | 656.27         | 1.94514     |
| $n_{C'}$           | 643.85         | 1.94649     |
| $n_{He-Ne}$        | 632.80         | 1.94775     |
| $n_D$              | 589.29         | 1.95349     |
| $n_d$              | 587.56         | 1.95375     |
| $n_e$              | 546.07         | 1.96073     |
| $n_F$              | 486.13         | 1.97465     |
| $n_{F'}$           | 479.99         | 1.97643     |
| $n_g$              | 435.84         | 1.99207     |
| $n_h$              | 404.66         | 2.00732     |
| $n_i$              | 365.01         | 2.03539     |
|                    |                |             |
|                    |                |             |

| Relative Partial Dispersion |        |
|-----------------------------|--------|
| $P_{d,C}$                   | 0.2918 |
| $P_{e,d}$                   | 0.2366 |
| $P_{g,F}$                   | 0.5904 |
| $P'_{d,c'}$                 | 0.2425 |
| $P'_{e,d}$                  | 0.2331 |
| $P'_{g,F'}$                 | 0.5224 |
|                             |        |

| Chemical Properties (grade) |   |
|-----------------------------|---|
| RC (S)                      | 1 |
| RA (S)                      | 1 |
| D <sub>w</sub>              | 1 |
| D <sub>A</sub>              | 1 |
| R <sub>OH</sub> (S)         | 1 |
| RP (S)                      | 1 |
| CR                          | 1 |

| Internal Transmittance |              |               |
|------------------------|--------------|---------------|
| $\lambda$ (nm)         | $\tau_{5mm}$ | $\tau_{10mm}$ |
| 2400                   | 0.917        | 0.840         |
| 2200                   | 0.976        | 0.952         |
| 2000                   | 0.989        | 0.979         |
| 1800                   | 0.996        | 0.993         |
| 1600                   | 0.999        | 0.998         |
| 1400                   | 0.999        | 0.999         |
| 1200                   | 0.999        | 0.999         |
| 1060                   | 0.999        | 0.999         |
| 1000                   | 0.999        | 0.999         |
| 950                    | 0.999        | 0.999         |
| 900                    | 0.999        | 0.999         |
| 850                    | 0.999        | 0.999         |
| 800                    | 0.999        | 0.999         |
| 750                    | 0.999        | 0.999         |
| 700                    | 0.999        | 0.999         |
| 650                    | 0.999        | 0.998         |
| 600                    | 0.999        | 0.998         |
| 550                    | 0.998        | 0.996         |
| 500                    | 0.993        | 0.986         |
| 480                    | 0.989        | 0.978         |
| 460                    | 0.983        | 0.967         |
| 440                    | 0.976        | 0.953         |
| 420                    | 0.963        | 0.927         |
| 400                    | 0.927        | 0.860         |
| 390                    | 0.894        | 0.800         |
| 380                    | 0.825        | 0.680         |
| 370                    | 0.686        | 0.470         |
| 360                    | 0.424        | 0.180         |
| 350                    | 0.141        | 0.020         |
| 340                    |              |               |
| 330                    |              |               |
| 320                    |              |               |
| 310                    |              |               |
| 300                    |              |               |
| 290                    |              |               |
| 280                    |              |               |

| Deviation of Relative Partial Dispersions |         |
|---|---------|
| $\Delta P_{F,e}$                          | -0.0006 |
| $\Delta P_{g,F}$                          | 0.0005  |
| $\Delta P_{C,t}$                          | 0.0018  |
| $\Delta P_{C,s}$                          | 0.0006  |

| Expansion Coefficient $\alpha$ ( $\times 10^{-7}/K$ ) |          |
|---|----------|
| $^{\circ}C$   | $\alpha$ |
| -50/-40   | 61       |
| -40/-30   | 64       |
| -30/-20   | 65       |
| -20/-10   | 67       |
| -10/0   | 69       |
| 0/10  | 70       |
| 10/20   | 71       |
| 20/30   | 72       |
| 30/40   | 73       |
| 40/50   | 74       |
| 50/60   | 74       |
| 60/70   | 75       |
| 70/80   | 75       |
| 80/90   | 76       |
| 90/100  | 76       |
| 100/110   | 77       |
| 110/120   | 78       |
| 120/130   | 80       |
| 130/140   | 81       |
| 140/150   | 82       |
| 150/160   | 83       |

| Thermal Properties                              |      |
|---|------|
| T <sub>g</sub> ( $^{\circ}C$ )                  | 723  |
| T <sub>s</sub> ( $^{\circ}C$ )                  | 763  |
| T <sub>10</sub> <sup>14.5</sup> ( $^{\circ}C$ ) | 680  |
| T <sub>10</sub> <sup>13</sup> ( $^{\circ}C$ )   | 716  |
| $\alpha_{-50/80^{\circ}C}$ ( $10^{-7}/K$ )      | 70   |
| $\alpha_{100/300^{\circ}C}$ ( $10^{-7}/K$ )     | 87   |
| $\lambda$ (W/(m K))                             | 1.01 |

| Constants of Dispersion Formula |                 |
|---------------------------------|-----------------|
| A <sub>0</sub>                  | 3.67292754E+00  |
| A <sub>1</sub>                  | -1.50437161E-02 |
| A <sub>2</sub>                  | 4.55746485E-02  |
| A <sub>3</sub>                  | 2.28731957E-03  |
| A <sub>4</sub>                  | -1.21744297E-04 |
| A <sub>5</sub>                  | 1.65263211E-05  |

| Mechanical Properties |       |
|-----------------------|-------|
| HK ( $10^7$ Pa)       | 730   |
| F <sub>A</sub>        | 61    |
| E (GPa)               | 128.5 |
| G (GPa)               | 49.5  |
| $\mu$                 | 0.297 |
| $\sigma_b$ (MPa)      | 61    |
| B ( $10^{-12}$ /Pa)   | 0.79  |

| Density                     | Solarization        |
|-----------------------------|---------------------|
| $\rho$ (g/cm <sup>3</sup> ) | $\Delta\lambda$ (%) |
| 4.94                        | -1.3                |

| Range of Temperature ( $^{\circ}C$ ) | Temperature Coefficients of Refractive Index    |     |     |     |       |     |     |     |     |      |
|--------------------------------------|---|-----|-----|-----|-------|-----|-----|-----|-----|------|
|                                      | dn/dt relative ( $\times 10^{-6} / ^{\circ}C$ ) |     |     |     |       |     |     |     |     |      |
|                                      | t   | s   | C   | C'  | He-Ne | d   | e   | F   | F'  | g    |
| -60 ~ -40                            | 3.1   | 3.8 | 4.2 | 4.3 | 4.4   | 4.9 | 5.2 | 6.1 | 6.2 | 7.4  |
| -40 ~ -20                            | 3.2   | 3.9 | 4.4 | 4.5 | 4.6   | 5.0 | 5.4 | 6.4 | 6.5 | 7.6  |
| -20 ~ 0                              | 3.4   | 3.9 | 4.4 | 4.5 | 4.7   | 5.1 | 5.6 | 6.7 | 6.8 | 7.9  |
| 0 ~ 20                               | 3.4   | 3.9 | 4.5 | 4.6 | 4.7   | 5.2 | 5.7 | 6.8 | 6.9 | 8.2  |
| 20 ~ 40                              | 3.4   | 4.0 | 4.6 | 4.7 | 4.8   | 5.3 | 5.9 | 7.0 | 7.1 | 8.6  |
| 40 ~ 60                              | 3.5   | 4.1 | 4.7 | 4.8 | 4.9   | 5.4 | 6.1 | 7.2 | 7.3 | 8.8  |
| 60 ~ 80                              | 3.6   | 4.3 | 4.9 | 5.0 | 5.1   | 5.6 | 6.3 | 7.5 | 7.6 | 9.2  |
| 80 ~ 100                             | 3.7   | 4.4 | 5.0 | 5.1 | 5.2   | 5.7 | 6.6 | 7.7 | 7.8 | 9.5  |
| 100 ~ 120                            | 3.7   | 4.5 | 5.1 | 5.2 | 5.3   | 5.9 | 6.8 | 7.9 | 8.0 | 9.7  |
| 120 ~ 140                            | 3.9   | 4.6 | 5.2 | 5.3 | 5.4   | 6.1 | 7.0 | 8.1 | 8.2 | 9.9  |
| 140 ~ 160                            | 4.0   | 4.7 | 5.3 | 5.4 | 5.5   | 6.3 | 7.2 | 8.3 | 8.4 | 10.1 |

| Coloration Code                        |           |
|--|-----------|
| $\lambda_{80}(\lambda_{70})/\lambda_5$ | (405)/355 |
| Coloration of Internal Transmittance   |           |
| $\lambda\tau_{80}/\lambda\tau_5$       | 390/352   |

| Constants of dn/dt |                |                |
|--------------------|----------------|----------------|
| D <sub>0</sub>     | D <sub>1</sub> | D <sub>2</sub> |
| 1.46E-06           | 1.08E-08       | -2.27E-11      |
| E <sub>0</sub>     | E <sub>1</sub> | $\lambda_{TK}$ |
| 9.17E-07           | 1.02E-09       | 2.53E-01       |