$PbMoO_4$ DATA SHEET

$PbMoO_4$ (Lead Molybdate) is a birefringent crystal that was originally developed in 1969 by Bell Laboratories for acousto-optic applications. It is grown by the Czochralski method with a typical boule size of 1" diameter by 4" long. $PbMoO_4$ is currently used in both acousto-optic devices and in polarization-based passive components for telecommunications. In spite of its relatively high refractive index, the surface reflection can be reduced below 0.1% from 1510-1590 nm for both "s" and "p" polarizations by anti-reflection coating. The physical and optical properties of $PbMoO_4$ are shown below:

Density[1]

$$\rho = 6.95 \frac{g}{cm^3}$$

Hardness[2]
3 Mohs

Transparency[1]
0.42-5.5 μm

Melting Temperature[3]

$$t_m = 1338K$$

Thermal expansion coefficients[4]

$$\alpha_{\|a} = 12.4 \times 10^{-6} / K \quad , \quad \alpha_{\|c} = 26.7 \times 10^{-6} / K$$

Birefringence ($\Delta n=n_o-n_e$@λ=1.550 μm)[5]
$\Delta n=0.090$; $n_o=2.260$; $n_e=2.170$;

Effective Birefringence (λ=1.550 μm)[4]

Δn_{eff} = 0.104

Thermo-optic coefficient (λ=1.550 μm)[4]

$$\frac{d(\Delta n_{eff})}{dT} = 190 \times 10^{-6} / K$$

Crystal type & space group[1]
Negative uniaxial; Tetragonal, $I4_1/a(C_{4h}^6)$, a=5.4312, c=12.1065 Angstroms

Sellmeier Equation (wavelength, λ, in μm; λ range: 0.44-1.08 μm)[3]

$$n_o = \sqrt{1 + \frac{3.54642\lambda^2}{\lambda^2 - (0.18518)^2} + \frac{0.58270\lambda^2}{\lambda^2 - (0.33764)^2}} \quad n_e = \sqrt{1 + \frac{3.52555\lambda^2}{\lambda^2 - (0.17950)^2} + \frac{0.20660\lambda^2}{\lambda^2 - (0.32537)^2}}$$

References

[1]N. Uchida and N. Niizeki, IEEE Proc. **61** (1973) p. 1073
[2]D.A. Pinnow, L.G. Van Uitert, A.W. Warner and W.A. Bonner, Appl. Phys. Lett. **15** (1969) p. 83.
[3]"Handbook of Optics" by the Optical Society of America; Michael Bass, editor in chief, 2nd edition, volume II, 1995; Part 4 - Optical and Physical Properties of Materials.
[4]Isomet measurement; $\Delta n_{eff} = \Delta n - \lambda \frac{\partial(\Delta n)}{\partial \lambda}$
[5]Ellipsometry measurement

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