

Laser Damage in Polarcor™ Polarizers

Like any other optical material, Polarcor™ polarizers can be optically damaged by high laser fluences. The data presented here are intended as representative only, and optical designers should test Polarcor™ polarizers in their specific application to ensure suitability.

Polarcor™ polarizers can undergo laser damage which results in loss of polarization contrast ratio. This occurs when the temperature in the material exceeds approximately 450 °C. At this temperature the elongated (prolate ellipsoidal) silver halide crystallites in the material melt and become more nearly spherical. This change in shape of the silver halide crystals disrupts the silver metal needles in the thin ($\approx 50 \mu\text{m}$) surface regions which make the Polarcor™ polarizer dichroic, and the contrast is reduced. The laser fluence at which the Polarcor™ polarizer material becomes hot enough for this damage to occur depends on many factors, among them:

- Is the laser polarization oriented parallel with the absorbing direction of the Polarcor™ polarizer? If the laser radiation is largely transmitted by the polarizer, the damage threshold will be higher than if most of the radiation is absorbed.
- How large is the illuminated spot? Smaller spots have a larger surface/volume ratio, so heat losses to material outside the illuminated region are relatively larger. It is thus more difficult to achieve a temperature which will damage the material.
- Is the laser operated CW or pulsed? Pulsed irradiation allows the heat to dissipate between pulses, so requires a higher fluence to achieve a temperature which will damage the polarizer.

All three of these factors can be observed in the data plot shown below.

- DMT 3/99

