GRADIENTS OF LIGHT DEPOLARIZATION AND BIREFRINGENCE IN PLZT CERAMICS

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Transparent lanthanum - modified lead zirconate titanate (PLZT) ferroelectric ceramics is used in visible and near infrared (IR) light modulators [1-3]. Important characteristics of the devices are contrast (modulations depth) and optical transparency which mainly dependent on homogeneity of the PLZT ceramics. Optical inhomogeneities may be of static and dynamic distribution. On the other hand one may also conventionally speak of microscopic and macroscopic optical inhomogeneities. Light scattering by static (e.g. micropores)[4] and dynamic (polarized microregions) [5] optical heterogeneities has been examined in the visible and near IR. The present report concerns topographical studies of static macroscopic optical inhomogeneities in PLZT ceramics. These can be observed in crossed polarizers. From the number of macroscopic defects listed by Haertling [6] we have chosen for a more detailed analysis the optical inhomogeneity caused by bulk radial stress.

The samples were cylindric plates of 60 mm diameter and 0.5-1.0 mm thick, i.e. they were cut from a ceramics cylinder perpendicular to its axis. Polished for optical use samples were placed between crossed polarizers on a coordinate table which allowed to move them in the X-Y plane. A scanning laser beam was directed along the Z axis.

At wavelength $\lambda = 0.63$ μm a radial gradient of light depolarization possibly was caused by overstoichiometric accumulation of PbO at the edge of the platelet.

The gradient of efficient birefringence ($\overline{\Delta n}$) along the disc radius were measured at $\lambda = 0.63$ μm and $\lambda = 1.15$ μm. Farther in the IR the radial gradient of the efficient birefringence was not observed. The increase of $\overline{\Delta n}$ towards the edge may be related to an increase of stress as well as of PbO concentration.

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