1C24

EVOLUTION OF ELECTRIC FIELD INDUCED POLAR MICROREGIONS IN PLZT CERAMICS

M.KNITE, A.KAPENIEKS, and A.STERNBERG
Institute of Solid State Physics, Latvia University, Kengaraga iela 8, 226063 Riga, Latvia

Experimental studies of electrooptical properties in the coarse grained (4-6 μm) PLZT 8.5/65/35 ceramics are reported. In this material dielectric polarization vs temperature decreases rapidly at temperature 17 °C. At the temperature 21 °C a double dielectric polarization vs electric field P(E) hysteresis loop is observed. At the electric field $E > E_{k1} = 6.8$ kV/cm a ferroelectric phase is induced, the following E decrease reverts to the non-ferroelectric state at $E < E_{k2} = 1.6$ kV/cm. It corresponds to the quasiparaelectric–ferroelectric phase transition [1].

The values of the extinction coefficient β determined by scattering were measured vs the light wave length λ at different constant values of E ($E < E_{k1}$).

To explain the scattering behavior we use the Usov-Shermergor relationship [2,3] for light scattering in heterogeneous dielectrics. We suppose scattering on the polarized microregions. The diameter and number of microregions change vs E. We have obtained both the diameter increase of microregions and the concentration of ferroelectric phase vs E. The amount of polarized microregions vs E shows the increase till E = 4.8 kV/cm with a following decrease at E > 4.8 kV/cm.

In order to eliminate the light scattering and depolarization the measurements of birefringence $\Delta n(E)$ were carried out using a CO cw laser (λ = 5.56 μm). We observed an anomalous $\Delta n(E) \sim E^4$ at $4 < E < 6$ kV/cm. We suppose that it is determined by the increase of the amount of ferroelectric phase vs E.

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