

Domain structure and optical properties of $\text{Pb}(\text{In}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{-Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-PbTiO}_3$ relaxor ferroelectric single crystals

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Relaxor ferroelectric single crystals, $\text{Pb}(\text{In}_{1/2}\text{Nb}_{1/2})\text{O}_3\text{-Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3\text{-PbTiO}_3$ (PIN-PMN-PT) is not only a kind of piezoelectric materials but also a kind of optical crystal. It is necessary to achieve single-domain state to ensure the uniformity of optical property. To avoid cracking, a method including annealing treatment with slow cooling and high-temperature poling are applied. Single-domain state is realized due to the release of strain of reversal of 90° domain structure. In addition, it is found that domain structure of unpoled crystal can be easily affected by mechanical stress. The single-domain crystal has an excellent transmission of 70% between 500 nm and 2.5 μm , and the optical absorption edge is about 400 nm. Besides, the refractive index was measured through Mach-Zehnder interferometer, and preliminary result indicates that refractive index is about 2.5~2.6, which is higher than most of optical crystal used in visible and near infrared wavelength. These results indicate that the crystal can be used in very wide region.