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Crystal growth and structural and piezoelectric characterizations of relaxor ferroelectric Mn:PIN-PMN-PT

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Abstract

The relaxor ferroelectric single crystals of PMN-PT family have great potential for applications in piezoelectric actuators and transducers. In this paper, Mn:PIN-PMN-PT piezoelectric single crystal with the chemical formula 24[Pb(Nb1/2In1/2)O3]-42[Pb(Mg1/3Nb2/3)O3-34PbTiO3 doped with 2 mol% Mn, with a diameter of 2 and a length of 5 cm was grown using the Bridgman method. The results of X-ray diffraction by the Lave and XRD methods showed that the obtained crystal was grown as a uniform single crystal along the [001] crystallographic direction. The Curie temperature of the single crystal sample was 150 °C, which was extracted by measuring the dielectric constant curve as a function of temperature. Fitting the dielectric constant curve data with the modified Curie-Weiss law confirmed the relaxor behavior of this single crystal. The results of the P-E loop measurement showed that this single crystal had a coercive field of 3.5 kV/cm and a saturation electric polarization of 30 μC/cm^2. The grown single crystal had a piezoelectric charge coefficient of 1455 pC/N.

Keywords: Single Crystal, Crystal Growth, Bridgman, Relaxor Piezoelectric, Electroacoustic Transducer

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