

[001]_c Textured Ternary Ceramics with Enhanced Piezoelectric Properties by Templated Grain Growth

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The ternary $\text{Pb}(\text{In}_{1/2}\text{Nb}_{1/2})\text{O}_3$ - $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - PbTiO_3 (PIN-PMN-PT) relaxor ferroelectric system has recently attracted considerable attention because of its broader temperature usage range, higher coercive field and comparable piezoelectric properties to binary PMN-PT. In this work, highly [001]_c textured PIN-PMN-PT ceramics with and without Mn-doping were fabricated by templated grain growth with PbTiO_3 -based platelets. The effects of texture engineering and Mn-doping on both dielectric/piezoelectric/ferroelectric properties and the corresponding domain structures of the ternary ceramics were investigated. The highly textured PIN-PMN-PT ceramics without Mn-doping exhibit ~200% improvement in the piezoelectric response as compared to the randomly oriented ceramics. Mn-doping induces "hard" characteristics and enhances the mechanical quality factor of the textured ceramics. These textured ceramics are very promising for high performance electromechanical applications.