Investigation of Morphotropic Phase Boundaries in the PIN-PSN-PT Ferroelectric Systems with High T_{rt} and T_c Phase Transition Temperatures

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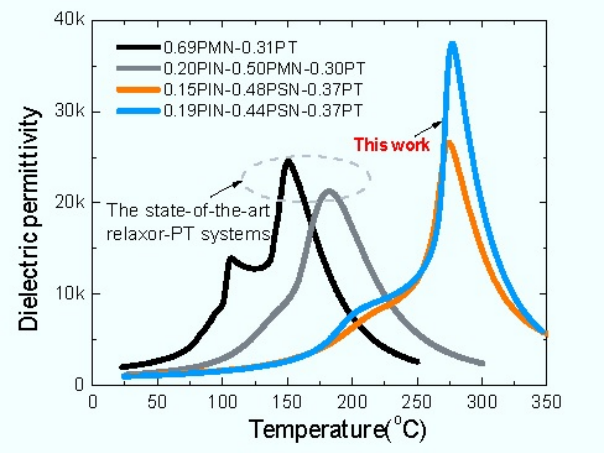
New morphotropic phase boundary (MPB) compositions with relatively high T_cs were projected in the $Pb(In_{1/2}Nb_{1/2})O_3$-$Pb(Sc_{1/2}Nb_{1/2})O_3$-$PbTiO_3$ (PIN-PSN-PT) solid solution based on the perovskite tolerance factor relationships, and were experimentally confirmed. The phase, dielectric, piezoelectric and ferroelectric properties of PIN-PSN-PT ceramics were investigated. According to the results of dielectric and pyroelectric measurements, high rhombohedral-tetragonal phase transition temperatures, T_{rt}s on order of 189~210 ^oC, Curie temperatures T_c on the order of 274~285 ^oC and piezoelectric coefficients d_{33} in the range of 310~360 pC/N, were achieved in xPIN-(1-x)PSN-0.37PT (x=0.15~0.23) ceramics, indicating promising relaxor-$PbTiO_3$ systems with high phase transition temperatures. The maps of T_c, T_{rt}, d_{33} and ε_r in the PIN-PSN-PT system were established, providing a clear direction for composition screening for future crystal growth.



New high-temperature relaxor-$PbTiO_3$ system