The Charge Release and Its Mechanism for $Pb(In_{1/2}Nb_{1/2})$-$Pb(Mg_{1/3}Nb_{2/3})$-$PbTiO_3$ Ferroelectric Crystals Under One-Dimensional Shock Wave Compression

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The charge release and related mechanisms for $Pb(In_{1/2}Nb_{1/2})$–$Pb(Mg_{1/3}Nb_{2/3})$–$PbTiO_3$ (PIN–PMN–PT) ferroelectric crystals under one-dimensional shock wave compression were investigated using discharge current profile measurement, by which the piezoelectric stress coefficient e_{31} and the phase transition (from tetragonal to orthorhombic phase) pressure were obtained, being –2.9 C/m^2 and 2.3 GPa, respectively. Based on experiment results and thermodynamics analysis, it was found that the one-dimensional shock compression favored ferroelectric phase, being different from the effect of hydrostatic pressure, which favored paraelectric phase. This phenomenon can be attributed to the crystal anisotropy and electromechanical coupling effects as one-dimensional shock compression is applied to PIN-PMN-PT ferroelectric crystals.