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Relaxation and leakage current characteristics of $Pb_{1-x}La_x(Zr_yTi_{1-y})_{1-x/4}O_3$ (PLZT) thin films with various Ir-based top electrodes

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The dielectric relaxation and leakage current characteristics were studied for PLZT capacitors with various iridium-based top electrodes. The dielectric relaxation current behavior of PLZT capacitors obeys the well-known Curie-von Schweidler law independent of various Ir-based top electrodes including Pt and shows surprisingly little impact of various atmospheres such as Ar, O_2, and H_2. Electrical charge hopping, bulk effect, is the dominant mechanism of a.c. electric conduction which exhibits a linear relationship with frequency at room temperature.

The true leakage current was separated definitively from the dielectric relaxation contributions. The PLZT capacitors with Pt or IrO_2 top electrodes contacted with PLZT films show strong time dependence of true leakage current, resulting in consistence with space-charge influenced injection model. On the other hand, true leakage current of capacitors with Ir or IrO_2/Ir top electrodes is independent of time, resulting in contradiction to the space-charge injection model. The IrPb, conducting phase, at interface between Ir top electrode and PLZT induces a steady state current behavior without the contribution of relaxation current. The second phase formed at interface modified the Schottky barrier height and increases the leakage current density.