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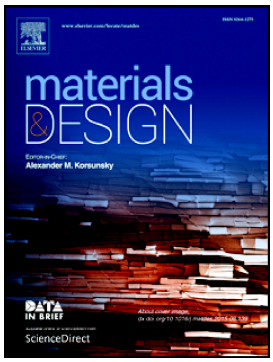

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Intrinsic dead layer effects in relaxed epitaxial $BaTiO_3$ thin film grown by pulsed laser deposition

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Abstract

Epitaxial $BaTiO_3$ (BT) thin film of about 400 nm thickness was grown on $LaSr_{0.5}Co_{0.5}O_3$ (LSCO) coated (001)MgO using pulsed laser deposition. Ferroelectric properties of the BT thin film in Pt/BT/LSCO/MgO heterostructure capacitor configuration were investigated. Dynamic P-E hysteresis loops at room temperature showed ferroelectric behavior with P_s = 32 µC/cm², P_r =14 µC/cm² and E_c=65 kV/cm. Static C-V measurements confirmed reversible switching with a coercive field E_c = 15 kV/cm. Basing on a model taking into account an interface dead-layer we show that the capacitance-voltage "butterfly" loops imply only 25% switching of dipoles that inferred from dynamic polarization-field loops (~ 4 and ~16 kV/cm, respectively). Dielectric permittivity as a function of temperature revealed a first-order ferroelectric-to-paraelectric (FE-PE) phase transition in the BT film characterized by a maximum at T_C ~130°C. The very large (~126 K at 1 kHz) difference between T_C and the extrapolated Curie-Weiss temperature T_0 is attributed to the dead-layer effects.

Keywords: Dead layer, Ferroelectric, $BaTiO_3$, Epitaxial growth, Pulsed laser deposition

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