Abstract Submitted
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Dielectric properties and electrical conduction of high-k $LaGdO_3$ ceramics[1] SHOJAN PAVUNNY, REJI THOMAS, ASHOK KUMAR, RAM KATIYAR, Department of Physics and Institute for Functional Nanomaterials, University of Puerto Rico, San Juan, PR, USA — The temperature and frequency dependent dielectric properties and leakage conduction mechanism in $LaGdO_3$ (LGO) ceramics have been studied and this material has been identified as a potential high-k candidate for the future complementary metal-oxide-semiconductor (CMOS) and dynamic random access memory (DRAM) technology nodes. The dielectric constant and the loss tangent at 100 kHz were ∼21.5 and ∼0.003 respectively at ambient conditions without any significant temperature and voltage dependence. The ac conductivity showed the typical features of universal dynamic response (UDR) and obey the double power law $\sigma_{ac} = \sigma_{dc} + A\omega^{n_1} + B\omega^{n_2}$ with three types of temperature dependent conduction processes involved; i) a dc plateau (< 3 kHz) due to long range translational hopping, ii) a mid frequency region due to the short range hopping (3 – 100 kHz), and iii) a high frequency region due to localized or reorientational hopping (100 – 1000kHz). The temperature dependent dc conductivity followed the Arrhenius relation with activation energies of 0.05eV in the 200 – 400 K range and 0.92 eV in the 400 – 600 K range. The leakage current behavior revealed bulk limited Poole-Frenkel (PF) conduction mechanism with very low leakage current density (2 nA / cm^2 at 5.7 kV/cm).

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