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Abstract Submitted
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Investigation of Electric Field–Induced Second Harmonic Generation from Fe-Doped $SrTiO_3$ Interfaces[1] DAVID ASCIENZO, HAOCHEN YUAN, STEVE GREENBAUM, CUNY-Hunter Coll, THORSTEN BAYER, RUSSELL MAIER, JIAN-JUN WANG, CLIVE RANDALL, ELIZABETH DICKEY, Pennsylvania State University, HAIBIN ZHAO, Fudan University, YUHANG REN, CUNY-Hunter Coll — Oxygen vacancy electromigration is a leading contributor to breakdown mechanisms such as resistance degradation in perovskite oxide dielectrics. Greater understanding of oxygen vacancy migration and the correlated formation of structural defects/strain at dielectric interfaces is crucial for improving lifetime and reliability in these materials. We report on structural changes at reduced and oxidized Fe-doped $SrTiO_3$ interfaces detected by electric field-induced second harmonic generation (EFISHG). Under a dc-field, oxygen ions and holes migrate to the anode while oxygen vacancies and electrons migrate to the cathode. Vacancy migration to the cathode leads to electrostrictive distortions, described as Fe:Ti-O bond stretching and bending, in $FeTiO_6$ octahedra. Differences in EFISHG responses are explained by intrinsic electric fields present at the interfaces whose local strength and polarity are influenced by the oxygen vacancy, Fe^{3+}, and Fe^{4+} concentrations of the crystals. Results show optical SHG is a powerful tool for detecting structural changes at perovskite oxide interfaces due to oxygen vacancy migration.

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