

Abstract Submitted  
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**Nonlinear Optical Detections of Structural Distortions at Degraded Fe-doped SrTiO<sub>3</sub> Interfaces** ONUR KURT, DAVID ASCIENZO, ZEHRA CEVHER, STEVE GREENBAUM, Hunter Coll, THORSTEN BAYER, CLIVE RANDALL, Pennsylvania State University, NICHOLAS MADAMOPOULOS, The City College of New York, YUHANG REN, Hunter Coll — We report on the detection of structural distortions at anode and cathode interfaces in degraded reduced and oxidized Fe-doped SrTiO<sub>3</sub> (Fe:STO) crystals using optical second harmonic generation (SHG) and Raman spectroscopy in the reflection geometry. SHG spectra were collected from various regions across the interfaces. SHG intensity changes are associated to the formation of centrosymmetric Fe<sup>4+</sup>:Ti<sup>4+</sup>-O<sub>6</sub> octahedra and non-centrosymmetric Jahn-Teller distortions in the inner region of the reduced anode and the central region of the oxidized anode, respectively. These results are supported by Raman measurements taken from the anode interfaces of both crystals, which present Fe<sup>4+</sup> concentration and structural changes across the probed regions. Moreover, the accumulation of oxygen vacancies is identified across the cathode interfaces of both crystals. These structural distortions and Fe<sup>4+</sup> concentration changes are well correlated with the migration of oxygen ions and vacancies.

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