

Abstract Submitted  
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**Ferromagnetism in SrTiO<sub>3</sub> Single Crystals Induced by Laser irradiation** SRINIVASA RAO SINGAMANENI, Y.F. LEE, J.T. PRATER, A.I. SMIRNOV, J. NARAYAN, North Carolina State University — SrTiO<sub>3</sub> (STO) is diamagnetic in pristine state, important in emerging field of complex oxide electronics. No attention has been paid to explore the magnetic properties of STO crystal upon laser irradiation/annealing. In this presentation, we demonstrate [1-2] that STO single crystals show ferromagnetic order up to 400 K upon KrF (248 nm) laser irradiation. The high resolution x-ray photo emission spectroscopy (XPS) measurements reveal a strong shift of Sr-, Ti- and O-related peaks. X-ray diffraction (XRD) of laser annealed STO does not reveal a signature of either secondary magnetic or amorphous phases. 300 K X-band ( $\sim 9.543$  GHz) angle-dependent electron paramagnetic resonance (EPR) measurements showed no evidence of additional magnetic peaks up on laser irradiation. XPS and EPR data did not provide a strong evidence of Ti<sup>3+</sup> formation upon laser annealing. No differences in the visible 300 K Raman spectra of pristine and laser annealed STO are noticed. Interestingly, the magnetic moment is decreased by almost 10-fold upon oxygen annealing of laser annealed STO, inferring that oxygen vacancies play an important role in establishing the observed ferromagnetism.

[1] S.S. Rao et al Appl. Phys. Lett. **105**, 042403 (2014); J. Appl. Phys., **116**, 094103 (2014).

Srinivasa Rao Singamaneni  
North Carolina State University

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