Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Atomic-scale structure and composition mapping in nickelate heterostructures DIVINE KUMAH, ANKIT DISA, JOSEPH NGAI, HANGHUI CHEN, SOHRAB ISMAIL-BEIGI, CHARLES AHN, FRED WALKER, Center for Research on Interface Structures and Phenomena and Department of Applied Physics, Yale University, New Haven, CT — Strongly correlated electronic systems display a wide range of interesting properties, including ferroelectricity, superconductivity, metal-insulator transitions, and novel magnetic phenomena. The electrical and magnetic properties of thin film heterostructures based on these systems are directly linked to their atomic scale structure and composition. This link is important for the rare earth nickelates, which exhibit first-order metal-insulator transitions, antiferromagnetism, and charge ordering. At the interfaces present in these systems, structural coupling can lead to new effects. We use a synchrotron-based resonant anomalous x-ray scattering method to elucidate the physical and electronic structure at complex oxide heterointerfaces of nickelates grown using molecular beam epitaxy. Temperature dependent resonant x-ray studies in doped 8 unit-cell thick $NdNiO_3$ films reveal subtle changes in atomic structure and Ni charge disproportionation at the metal-insulator transition.

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Date submitted: 28 Nov 2012 Electronic form version 1.4