Probing the Nickelate Ground State in NdNiO3 Superlattices
ANKIT DISA, DIVINE KUMAH, JOSEPH NGAI, FRED WALKER, CHARLES AHN, Center for Research on Interface Structures and Phenomena and Department of Applied Physics, Yale University — The rare-earth nickelates of the type RNiO$_3$ exhibit tunable, sharp metal-insulator transitions as a function of R size, film thickness, and external fields. The nature of these transitions has been the subject of much study, including examination of the insulating ground state. NdNiO$_3$ has garnered particular interest due to a concomitant magnetic crossover to an antiferromagnetic state occurring at the metal-insulator transition temperature. Several previous studies have focused on thin films; in this work, we examine NdNiO$_3$ layers confined in heterostructures. The metal-insulator transition temperature can be manipulated based on the thickness of the NdNiO$_3$ layers within the heterostructure, and a suppression of the high-temperature metallic phase leads to a crossover to localization related to a change in dimensionality. The electronic structure of these phases probed using x-ray absorption spectroscopy enables us to elucidate the link between potential charge ordering and dimensionality in the ground state of this system.

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