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Suppression of charge and spin order in confined $NdNiO_3$ layers ANKIT DISA, DIVINE KUMAH, ANDREI MALASHEVICH, SOHRAB ISMAIL-BEIGI, FRED WALKER, CHARLES AHN, Yale University — Atomic-layer synthesis allows one to study and control the complex phase behavior correlated systems by controllably modifying dimensionality and interfacial constraints. To this end, the rare-earth nickelates (RNiO$_3$) embody a remarkable model system, as exhibited by the bulk metal-insulator and paramagnetic-antiferromagnetic ordering transitions, which are sensitive to structural and electronic conditions. We present evidence from transport, x-ray absorption, and resonant x-ray scattering measurements of $NdNiO_3/NdAlO_3$ superlattices of a suppression of charge and spin order induced by interfacial confinement. We find that the spectroscopic signatures of charge localization and antiferromagnetic ordering remain for $NdNiO_3$ layers thicker than a single unit cell. The disappearance of ground state order in single $NdNiO_3$ layers is attributed to enhanced e_g orbital polarization from the interaction with the $NdAlO_3$ confining layers. We also observe a crossover region of thickness with no metal-insulator transition but distinct charge and spin ordering temperatures. These findings shed light on the interplay between competing ground states in nickelates and help guide efforts to controlling long-range order in such systems.

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