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Strain-controlled electronic properties of NdNiO₃ ultrathin films¹

JIAN LIU, University of Arkansas, M. KAREEV, B. GRAY, P. RYAN, J.W. KIM, J.W. FREELAND, J. CHAKHALIAN — Complex oxides are known for a rich diversity of tunable intriguing phases due to strong couplings among multiple degrees of freedom of d electrons. Recent advances in epitaxial growth of complex oxides with atomic-scale precision have opened new possibilities to stabilize unusual phases in nanostructures. Understanding strongly correlated electron behavior in the ultrathin limit becomes fundamentally critical for building heterostructures with engineered properties. In particular, epitaxial strain is a potent control parameter which can profoundly affect the electronic structure of correlated materials. But its effect is difficult to quantify due to relaxation that may occur during the growth. To this end, we have grown perfectly strained atomic layers of NdNiO₃ by PLD on a series of substrates with large variation in lattice mismatch. Our detailed study including electric and thermo-transport, XRD and XAS, shows dramatic modifications of electronic properties induced by strain and possible mechanisms will be discussed.

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