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Electrostatic control of the metal-insulator transition of ultrathin $NdNiO_3$ films JUNWOO SON, BHARAT JALAN, ADAM P. KAJDOS, Materials, UCSB, LEON BALENTS, S. JAMES ALLEN, Physics, UCSB, SUSANNE STEMMER, Materials, UCSB — Rare earth nickelates ($RNiO_3$) exhibit a first order metal insulator transition upon cooling. Bulk studies on chemical doping indicated that both divalent and quatrovalent ions were effective in shifting T_{MIT} to lower temperatures by $\sim$ 50 to 25 K for 1 % hole and electron doping, respectively. However, separating the influence of structural distortions from band filling is particular important for the nickelates. Here we present a new approach to control the band-filling in nanoscale $NdNiO_3$ thin films by modulation doping. $NdNiO_3$ is remotely doped by interfacing it with a degenerately doped conventional band insulator, La-doped $SrTiO_3$. We show that the remote doping approach allows for purely electronic modulation of a carrier density in the absence of other structural changes. The proposed approach is experimentally tested using ultrathin (2.5 nm) $NdNiO_3$ films grown on La-doped $SrTiO_3$ films with different carrier concentrations. We show that remote doping systematically changes the charge carrier density in the $NdNiO_3$ film and causes a moderate shift ($\sim$ 20 K) in the metal-insulator transition temperature. These results will be discussed in the context of theoretical models of the materials exhibiting a metal-insulator transition.

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