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Low dimensional Mott material: Transport in ultra thin epitaxial $LaNiO_3$ JUNWOO SON, POUYA MOETAKEF, JAMES M. LEBEAU, DANIEL OUELLETTE, LEON BALENTS, S. JAMES ALLEN, SUSANNE STEMMER, University of California, Santa Barbara — Ultrathin Mott materials, close to a metal-insulator transition, are expected to be sensitive to local bonding, coordination, strain and dimensionality. $LaNiO_3$ films have recently attracted interest because of theoretical predictions of antiferromagnetism and high-temperature superconductivity in superlattices. We have grown ultrathin, epitaxial $LaNiO_3$ on different substrates, $(LaAlO_3)_{0.3}(Sr_2AlTaO_6)_{0.7}$ (LSAT) and $LaAlO_3$ (LAO). High oxygen pressures were required for stoichiometric films. Atomic resolution Z-contrast imaging confirmed that all $LaNiO_3$ films were epitaxial and continuous down to 2.5 nm. Resistivity, magnetoresistance, Hall coefficient and mobility were measured between 2 and 300 K. The resistivity (< 200 $\mu\Omega$ cm) was comparable to bulk for films down to 5 nm on LSAT and 3 nm on LAO, indicating good oxygen stoichiometry. All films showed temperature dependent Hall coefficients indicative of both electron and hole contributions. For 4 nm films on LSAT and 2.5 nm films on LAO, weak localization was observed. Films below 4 nm on LSAT (tensile stress) were strongly localized while those on LAO (compressive stress) remained metallic at thicknesses down to 2.5 nm. We will discuss these results in the context of confinement in ultrathin Mott materials.

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