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Optical conductivity and magnetic properties of ultrathin epitaxial $LaNiO_3$ under compressive and tesile strain.[1] DANIEL OUELLETTE, JUNWOO SON, JAMES LEBEAU, POUYA MOETAKEF, LEON BALENTS, SUSANNE STEMMER, S. JAMES ALLEN, University of CA, Santa Barbara — The perovskite oxides $RNiO_3$, (R = rare earth) exhibit a charge transfer metal-insulator (MI) transition to an antiferromagnetic state as a function of temperature and rare earth ionic radius. Bulk, stochiometric $LaNiO_3$ is the only member of the series to exhibit metallic conductivity at all temperatures (4-300 K). Motivated by the expectation that reduced dimensionality and strain will alter the nickelate series MI transition, we have grown ultrathin stoichiometric epitaxial films of $LaNiO_3$ on $LaAlO_3$and (LaSr) (Al,Ta)O_3 substrates by rf magnetron sputtering. We present magnetic susceptibility and optical conductivity measurements up to 3 eV, and from 2 to 300 K on films as thin as 3 nm. Optical conductivity is measured by near normal incidence reflectivity and indicates strong thickness and strain dependent deviations from the Drude model. Low frequency reflectivity data extrapolates to measured DC conductivity which indicates a thickness and strain dependent MI transition. We compare our results to bulk measurements and to models of the ground state and transport properties of the nickelates.

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