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Magnetotransport behavior in $(LaNiO_3)_n/(LaMnO_3)_2$ superlattices JASON HOFFMAN, Materials Science Division, Argonne National Laboratory, ANAND BHATTACHARYA, Materials Science Division and Center for Nanoscale Materials, Argonne National Laboratory — Recent advances in the deposition of epitaxial complex oxides have enabled the fabrication of a wide range of materials structures with atomically abrupt interfaces, that are characterized by novel electronic and magnetic ground states. In particular, superlattices that combine the paramagnetic metal, $LaNiO_3$, with various band insulators, such as $SrTiO_3$ and $LaAlO_3$, have attracted considerable theoretical and experimental interest. In this work, $(LaNiO_3)_n/(LaMnO_3)_2$ ($2 \leq n \leq 5$) superlattices that combine $LaNiO_3$ with an antiferromagnetic insulator are prepared on (001) $SrTiO_3$ substrates using ozone-assisted oxide molecular beam epitaxy. The total superlattice thickness is fixed at $\sim$30 nm. X-ray reflectivity and x-ray diffraction reveal single-crystalline growth with interfacial and surface roughnesses of $\sim$0.2 nm and $\sim$0.5 nm, respectively. Electrical transport measurements carried out on superlattices with $n \leq 3$ show insulating behavior between 5 K and 300 K, while samples with n = 4,5 are metallic with resistivity minima at 90 K and 30 K, respectively, below which we observe negative magnetoresistance. We discuss the role of charge transfer between $LaNiO_3$ and $LaMnO_3$ in understanding these results.

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