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Magnetism, Chemical Ordering, and Defects in Epitaxial Double Perovskite La_2MnNiO_6 Thin Films. TIM DROUBAY, STEVEN SPURGEON, YINGGE DU, ARUN DEVARAJ, Pacific Northwest National Laboratory, STEVE HEALD, Advanced Photon Source, Argonne National Laboratory, PETER SUSHKO, Pacific Northwest National Laboratory, TORGNY GUSTAFFSON, Rutgers University, DAVID KEAVNEY, Advanced Photon Source, Argonne National Laboratory, SCOTT CHAMBERS, Pacific Northwest National Laboratory — Oxide double perovskites ($A_2BB'O_6$) exhibit an interesting variety of electronic and magnetic properties such as half-metallicity and high temperature ferromagnetism holding promise for potential technological applications. We have investigated $La_2MnNiO_6/SrTiO_3$ grown using molecular beam epitaxy and have found different proportions of two ferromagnetic phase transitions (˜130K and ˜290K) and various saturation magnetization values (<4.6 μ_B/f.u.) dependent upon post-growth annealing. Contrary to previous reports, neither the increase in the saturation magnetization nor the Curie temperature(s) after annealing can be attributed to changing Mn and Ni valence. Instead, using aberration-corrected transmission electron microscopy and atom probe tomography, we observe large-scale chemical ordering as a result of annealing. We also find the coexistence of NiO-derived extended defects that appear to prevent the magnetic moment from reaching the maximum possible value (5 μ_B/f.u.). We will describe these results in light of first principles calculations which suggest that local deviations from the ideal stoichiometry facilitate the formation of the NiO phase and structural disorder in the double perovskite phase.

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