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Magnetism and Nanoscale Structural and Compositional Irregularities in MBE-grown La_2MnNiO_6 on $SrTiO_3$(001) SCOTT CHAMBERS, YINGGE DU, TIMOTHY DROUBAY, PETER SUSHKO, STEVEN SPURGEON, ARUN DEVARAJ, MARK BOWDEN, V SHUTTHANANDAN, Pacific Northwest Natl Lab, TORGNY GUSTAFSSON, Rutgers University — Double perovskites ($A_2BB'O_6$) are a fascinating class of oxides with considerable potential for applications requiring ferromagnetic and semiconducting properties. We have investigated MBE-grown La_2MnNiO_6 and have found that despite the fact that Mn and Ni are present as 4+ (d^3: $t_{2g}^3 e_g^0$) and 2+ (d^8: $t_{2g}^6 e_g^2$) respectively, and exhibit suitable XMCD signatures, the volume-averaged moment per formula unit is considerably less than 5 Bohr magnetons. Our electron energy loss spectroscopy (STEM-EELS) and atom probe tomography (APT) results to date reveal that there is considerable disorder in the B-site sublattice for as-deposited films, despite excellent volume-averaged stoichiometry. While air annealing results in substantial ordering, the moment remains low due to the nucleation of NiO inclusions with needle-like shapes revealed only by APT. First principles modeling suggests that even though the double perovskite is quite stable if nucleated in excess O, the presence of O vacancies facilitates structural disorder. In this talk, we will present our latest results on this fascinating material.

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