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Two-dimensional $La_{2/3}Sr_{4/3}MnO_4$ Manganite Films Probed by Epitaxial Strain and Cation Ordering BRITTANY NELSON-CHEESEMAN, Materials Science Division, Argonne National Laboratory, TIFFANY SANTOS, Center for Nanoscale Materials, Argonne National Laboratory, ANAND BHATTACHARYA, Materials Science Division, Argonne National Laboratory — Dimensionality is known to play a central role in the properties of strongly correlated systems. Here we investigate magnetism and transport in thin films of the Ruddlesden-Popper n=1 phase, $La_{1-x}Sr_{1+x}MnO_4$. Within this material, the MnO_6-octahedra form two-dimensional perovskite sheets separated by an extra rocksalt layer. By fabricating high quality thin films with ozone-assisted molecular beam epitaxy, we study how the effects of epitaxial strain and intentional cation ordering, known as digital synthesis, influence the properties of this 2-dimensional manganite. For example, at the same Mn^{3+}:Mn^{4+} ratio (2:1) as its fully spin-polarized 3D manganite counterpart, this two dimensional analog at x=1/3 only displays a spin glass phase below 20K in bulk. This is believed to result from a competition between superexchange and double exchange, as well as disordered Jahn-Teller distortions. However, in our films we find weak ferromagnetic order up to much higher temperatures in addition to a low temperature spin glass phase. We will discuss how strain and cation order effect the presence of this weak ferromagnetism.

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