

Electronic phase separation and CMR-effect in manganite films

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Epitaxial La_{3/4}Ca_{1/4}MnO₃/MgO(100) (LCMO) thin films show an unusual rhombohedral (R-3c) structure with a new perovskite superstructure at room temperature due to the CE-type ordering of La and Ca with modulation vector $q = 1/4$. A-site ordered films were found to be electronically homogeneous down to the 1 nm scale as revealed by scanning tunnelling microscopy/spectroscopy. In contrast, orthorhombic and A-site disordered LCMO demonstrate a mesoscopic phase separation far below the Curie temperature (T_C). In a manganite film without quenched disorder, we show texturing in the form of insulating and metallic stripes above and below Curie temperature (T_c), respectively, by high resolution scanning tunneling microscopy/spectroscopy (STM/STS). The formation of these stripes involves competing orbital and charge orders, and are an outcome of overlapping electron wavefunctions mediated by long-range lattice strain.