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Surface roughness systematics in manganite thin films grown by pulsed laser deposition[1] C. CARDOSO, S.B. OGALE, S. DHAR, S.R. SHINDE, T. VENKATESAN, Center for Superconductivity Research, Department of Physics, University of Maryland, College Park — Surface roughness is a critical quality factor in high quality heterointerface-based devices for oxide electronics. Given the significance of manganite films in the potential spin valve and magnetic tunnel junction type spintronics devices, we have examined the roughness systematics of the corresponding films grown by pulsed laser deposition (PLD) on key substrates such as (001) $LaAlO_3$ (LAO) and (001) $SrTiO_3$ (STO). Thus films of $La_{0.7}Sr_{0.3}MnO_3$ were grown by PLD at different substrate temperatures in the range 600-800 °C at oxygen pressures in the range 20-200 mTorr. Films with thickness in the range between a few nanometers up to several hundred nanometers were examined for surface roughness (by using Atomic Force Microscopy) as well as various other properties such as crystallinity (x-ray diffraction and Rutherford backscattering channeling), four probe resistivity and magnetization (squid magnetometry). Films thinner than about 20 nm were found to be extremely flat on both the substrates. The surface roughness increase with thickness showed a two step transition-like structure in the case of LAO while a single step structure in the case of the STO substrate. The transport and magnetization properties exhibited a monotonic change with thickness in the case of STO, but a non-monotonic behavior in the case of LAO substrate.

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