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Strain effect on Magnetism at the Manganite Interfaces: $SrMnO_3/LaMnO_3$ BIRABAR NANDA, SASHI SATPATHY, University of Missouri, Columbia — Recently it has been shown that new magnetic and electronic phases can be produced by varying the strain condition at the manganite interfaces[1]. From the density-functional studies of the electronic structure at the interface of $SrMnO_3$ and $LaMnO_3$ we show that the epitaxial strain, which enforces a tetragonal distortion, splits the itinerant interface Mn-e_g states to x^2-y^2 and $3z^2$-1 states. If the strain is tensile in the plane the x^2-y^2 orbital becomes more occupied, enhancing thereby the ferromagnetic double exchange which overcomes the antiferromagnetic super exchange between the core t_{2g} states to produce a net in-plane ferromagnetic interaction. Due to the lower occupancy of the $3z^2$-1 orbitals, the super exchange supercedes the double exchange to produce out-of-plane antiferromagnetic ordering. For in-plane compressive strain higher occupancy of $3z^2$-1 orbital results in the out-of-plane ferromagnetic ordering while in-plane ordering remains antiferromagnetic. Without any epitaxial strain, the itinerant x^2-y^2 and $3z^2$-1 states are more or less equally occupied and ferromagnetic ordering prevails both in-plane and out-of-plane. While for the tensile strain we find the heterostrutcure to be metallic, for the compressive strain an insulating phase is obtained if the strain is sufficiently large. This work was supported by DOE-DE-FG02-00ER45818.
1. H. Yamada et al. Appl. Phys. Lett. **89**, 052506 (2006)

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