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Polarcatrosphy and electronic reconstructions in $LaAlO_3/SrMnO_3$ (111) digital heterostructures[1] FANG HOU, Department of Mathematics and Physics, Suzhou University of Science and Technology, Suzhou, PR China, SHENG JU, TIAN-YI CAI, Department of Physics, Soochow University, Suzhou, PR China — Based on extensive first-principle density functional theory calculations, we report different electronic phases at the $LaAlO_3/SrMnO_3$ (111) heterointerfaces. In the n-type $LaAlO_3/SrMnO_3$ (111) supperlattices, electrons transferred from $LaAlO_3$ component distribute unevenly in $SrMnO_3$ component and occupy Mn's e_g orbital, inducing half-metallic ferromagnetism in the framework of Zener double exchange. With increasing $SrMnO_3$ layers, the sum of every Mn magmon keep a constant suggesting a fixed number of charge transferred from $LaAlO_3$ component. For p-type superlattices, holes reside almost uniformly at the SrO_3 and LaO_3 plane drived by the polar electric field in the $LaAlO_3$ and $SrMnO_3$ component. With absence of the e_g states at the Mn sites, bulk-like G-type AFM ordering were obvious with almost imperceptible octahedron rotation and tilting. But p-type superlattices are metallic because of hole transfer. Our studies demonstrate the potential applications of perovskite heterointerfaces in spintronic devices.

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