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Half-Metallic Ferromagnetism in $LaAlO_3/SrMnO_3$ Nanosheet Superlattices FANG HOU, TIAN-YI CAI, SHENG JU, MING-RONG SHEN, Department of Physics, Soochow University, Suzhou, PR China — Based on first-principle density-functional theory, we have revealed a robust half-metallic ferromagnetism in $LaAlO_3/SrMnO_3$ nanosheet supperlattices. Interface electronic reconstruction, where electrons transfer from the $(LaO)^+$ layer to the adjacent $(MnO_2)^0$ layer, is found to lead to the partially occupied e_g orbitals at the Mn sites and the half-metallic state in nn-type superlattice via the Zener double-exchange mechanism. On the other hand, holes transfer from $(AlO_2)^-$ layer to $(SrO)^0$ layer and reside mainly at oxygen sites in $SrMnO_3$, leading to either the preserved G-type AFM ordering in pp-type superlattices or complex magnetic ordering in np-type superlattices. When these systems transist to ferromagnetic ordering by an external magnetic field, an obvious change of electronic states at the Fermi level is found, suggesting a large magnetoresistive effect therein.

Fang Hou
Dept of Physics, Soochow University, Suzhou, PR China

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