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Signatures of a Two-Dimensional Ferromagnetic Electron Gas at the $La_{0.7}Sr_{0.3}MnO_3$/ $SrTiO_3$ Interface Arising From Orbital Reconstruction[1] MARIA J. CALDERON, ICMM-CSIC, NORBERT NEMES, JUAN IGNACIO BELTRAN, FLAVIO BRUNO, JAVIER GARCIA-BARRIOCANAL, ZOUHAIR SEFRIOUI, CARLOS LEON, Universidad Complutense de Madrid, MAR GARCIA-HERNANDEZ, CARMEN MUÑOZ, LUIS BREY, ICMM-CSIC, JACOBO SANTAMARIA, Universidad Complutense de Madrid — The interface between two different oxides has properties different from the ones corresponding to the constituent layers in bulk. Different orders can arise due to the complexity of these materials in which the orbital degree of freedom, magnetism and lattice are strongly interdependent. Here we present a joint theoretical-experimental effort to understand the properties of a multilayer formed by a metallic ferromagnetic manganite oxide ($La_{0.7}Sr_{0.3}MnO_3$) and the insulating $SrTiO_3$. Magnetoresistance measurements as a function of the relative angle between the magnetic field and the interface plane have shown an unexpected in-plane peak. Calculations of resistivity in a model system including spin-orbit coupling reveal that the unexpected in-plane maximum is due to transport through a two-dimensional ferromagnetic electron gas formed by orbital reconstruction at the manganite interface. These orbital and magnetic reconstructions are supported by X-ray linear dichroism and ab-initio calculations. Advanced Materials DOI:10.1002/adma.201402829.

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Maria J. Calderon
ICMM-CSIC

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