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Transport through oxide interfaces - The case of $SrTiO_3$ based hetero-structures[1] M. BEN SHALOM, E. FLEKSER, Y. DAGAN, Raymond and Beverly Sackler School of Physics and Astronomy, Tel-Aviv University, Israel, M. KIM, C. BELL, Y. HIKITA, H.Y. HWANG, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, Menlo Park, California 94025, USA — Sharp interfaces can host phenomena that are absent in their constituting materials. By depositing a thin layer of $LaAlO_3$ on top of $SrTiO_3$, the interface between these two band-insulator is highly conducting. Conductivity emerges only for TiO_2 termination and above a critical $LaAlO_3$ thickness of 4 unit cells, pointing to the importance of the polar structure. The transition, from insulating to high mobility electron gas, can be controlled continuously by gate voltage, thus enabling a careful study of the dependence of system properties on charge density. Carrier-controlled two-dimensional superconductivity, and magnetic hysteresis were observed between the two non-magnetic oxides. We have found anisotropic magnetoresistance (AMR) in our samples, an outcome of magnetic scattering, which affect the transport through the spin orbit (SO) interaction, and coexists with superconductivity. Gate bias enables tuning the SO energy, which dominates the magnetotransport properties. The exceptionally large amplitude and sign of the AMR suggests a Rashba-type SO coupling. The different AMR characteristics for Nb doped $SrTiO_3$, a symmetric non-polar with similar resistivity and carrier density, demonstrates the significant role of interface polarity for its magnetic properties.

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