Two-dimensional electron superconducting gas at oxide interfaces

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Résumé

Transition metal oxides display a great variety of quantum electronic behavior where correlations often play an important role. The achievement of high quality epitaxial interfaces involving such materials gives a unique opportunity to engineer artificial materials where new electronic orders take place. It has been shown recently that a two-dimensional electron gas could form at the interface of two insulators such as LaAlO3 and SrTiO3 [1], or LaTiO3 (a Mott insulator) and SrTiO3 [2]. We present low temperature transport and magneto-transport measurements on LaTiO3/SrTiO3 hetero-structures, the properties of which can be modulated by the field effect using a metallic gate on the back of the substrate. The corresponding phase diagram has been investigated, and superconductivity put into evidence for the first time in this system [3]. We will discuss the role of the confinement potential and the SrTiO3 band structure on the phase diagram, and show the specific role of the spin-orbit coupling. [1] N. Reyren et al, Science 317, 1196 (2007) [2] A. Ohtomo et al, Nature 419, 378 (2002) [3] J. Biscaras, N. Bergeal et al, 1,89 Nature Communications (2010)

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