Effects of high hydrostatic pressure in the 2D electron system at the interface between two oxides

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Two dimensional electron systems (2-DES) in oxides such as the one formed at the interface between $LaAlO_3$ and $SrTiO_3$, two band insulators, show rich and intriguing properties.[1] These include superconductivity[2] below 300 mK as well as the tunability under electric fields, which can switch the 2-DES from metallic to insulator, a feature exploited in transistors fully made of oxide materials.[3] In this work we present an entirely different and new way of tuning the electronic transport of the 2-DES, which directly exploits the sensitivity of the 2-DES to the microstructure of the hosting lattice: hydrostatic pressure. By means of transport experiments we show that moderate pressures below 2 GPa suffice to produce a substantial and reversible change in the conductivity, carrier density, and mobility of the 2-DES. Density Functional Theory calculations predict an increase of the carrier density in agreement with the experiment, and reveal that the reduction of polar distortions in the $LaAlO_3$ could underlie such effect.

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[1] A. Ohtomo and H. Y. Hwang, Nature **427** 6973 (2004)

[2] N. Reyren *et al.* Science **317** 1196 (2007)

[3] R. Jany *et al.* Advanced Materials Interfaces **1** 1300131 (2014)