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Quantum Confinement at Polar Oxide Interfaces STEFANO GARIGLIO, DANFENG LI, ZHENPING WU, WEI LIU, ALEXANDRE FETE, MARGHERITA BOSELLI, DQMP, University of Geneva, SEBASTIEN LEMAL, Theoretical Materials Physics, University of Lige, NICHOLAS BRISTOWE, Department of Materials, Imperial College London, PHILIPPE GHOSEZ, Theoretical Materials Physics, University of Lige, MARC GABAY, Laboratoire de Physique des Solides, Universit Paris-Sud, JEAN-MARC TRISCONE, DQMP, University of Geneva — The discovery of a two-dimensional electron liquid (2DEL), confined at the interface between the two band insulators $LaAlO_3$ (LAO) and $SrTiO_3$ (STO) has generated tremendous research interest. The 2DEL confinement lifts the degeneracy of Ti t_{2g} orbitals and promotes exotic physical properties. A previous study [1] has demonstrated that a 2DEL is also observed when LAO is alloyed with STO $(La,Al)_{1-x}(Sr,Ti)_xO_3$ (LASTO:x). The threshold thickness required for the onset of conductivity scales with x. We present here a study of superconductivity at the (LASTO:0.5)/STO interface. The thickness of the 2DEL, measured using perpendicular and parallel critical fields, is larger than the one at the LAO/STO interface. This change is due to a modification on the confining potential linked to a reduced charge transfer that is scaling as $1/x$. This scenario is also confirmed by a self-consistent Poisson-Schrdinger model and ab initio calculations. These compelling evidences support an intrinsic origin to the formation of the 2DEL in the LAO/STO system.

M.L. Reinle-Schmitt, et al., Nature Commun. 3, 932 (2012).

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