

Magnetism of LaAlO₃/SrTiO₃ Heterostructure Interface

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The LaAlO₃/SrTiO₃ heterostructure is a potential candidate for a high mobility two-dimensional electron system with novel electronic and magnetic properties. Although LaAlO₃ and SrTiO₃ are both large-gap band insulators, the interface is conductive, and even superconducting below 200 mK. Negative electronic compressibility is observed as the carrier density is tuned through electric field effect [1]. Magnetic ordering has been proposed to arise from the d-electrons transferred by polarization discontinuity. However the magnetization of this system has not previously been studied, because of the small volume of the interface. Using torque magnetometry, we detect the magnetic moment of the interface system directly [2]. Our results indicate the existence of a magnetic ordering at the two-dimensional conductive interface. More importantly, the same magnetic behavior persists even when the sample is superconducting, which suggests an unconventional two-dimensional superconducting phase.

[1] Lu Li, C. Richter, S. Paetel, T. Kopp, J. Mannhart, and R. C. Ashoori *Science* 332, 825 (2011)

[2] Lu Li, C. Richter, J. Mannhart, and R. C. Ashoori *Nature Physics* 7,762 (2011)