

Abstract Submitted
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Magnetism and superconductivity at LAO/STO-interfaces: the role of Ti 3d interface electrons¹ NATALIA PAVLENKO, Institute of Physics, University of Augsburg (Germany); Institute for Condensed Matter Physics, Lviv (Ukraine), THILO KOPP, Institute of Physics, University of Augsburg (Germany), E.Y. TSYMBAL, Department of Physics and Astronomy, University of Nebraska-Lincoln, G.A. SAWATZKY, Department of Physics and Astronomy, University of British Columbia, Vancouver, JOCHEN MANNHART, Max Planck Institute for Solid State Research, Stuttgart (Germany) — Ferromagnetism and superconductivity are in most cases adverse. However, recent experiments reveal that they coexist at interfaces of LaAlO₃ and SrTiO₃ [1]. We analyze the ferromagnetic state within density functional theory and provide evidence that it is also generated by Ti 3d interface electrons, as is the two-dimensional electron liquid at the interface which gives rise to superconductivity [2]. We demonstrate that oxygen vacancies in the TiO₂ interface layer enhance the tendency for ferromagnetism considerably. This allows for the notion that areas with increased density of oxygen vacancies produce ferromagnetic puddles and account for the previous observation of a superparamagnetic behavior in the superconducting state [3].

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

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

[3] N.Pavlenko, T.Kopp, E.Y.Tsymbal, G.A.Sawatzky, and J.Mannhart, cond-mat/arXiv:1105.1163 (2011)

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