



## Department of Physics Colloquium

Friday, September 25, 2009 • 4:00 P.M. • 2241 Chamberlin Hall

cookies & coffee served at 3:30 p.m

# New Phenomena at Oxide Interfaces

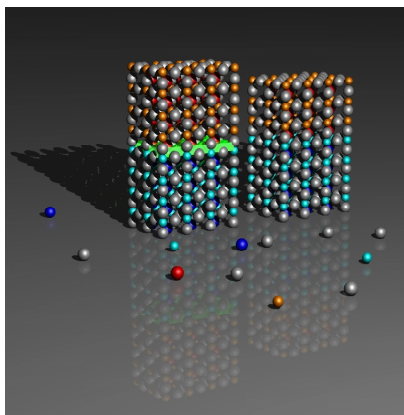


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Host: Rzchowski

At interfaces between complex oxides, electronic systems with unusual properties can be generated [see for instance 1,2]. A striking example is the interface between  $\text{LaAlO}_3$  and  $\text{SrTiO}_3$ , two good insulating perovskite oxides, which was found in 2004 to be conducting with a high mobility [3]. We discovered that the ground state of this system is a superconducting condensate, with a critical temperature of about 200 mK [4]. The characteristics observed for the superconducting transitions are consistent with a two-dimensional superconducting sheet a few nanometers thick. Recent field effect experiments revealed the sensitivity of the normal and superconducting states to the carrier density. In particular, the electric field allows the tuning of the critical temperature between 200 mK and 0 K and thus the on-off switching of superconductivity, revealing a complex phase diagram and a superconductor to insulator transition[5]. Recent results suggest that this phase diagram is linked to the large interfacially generated spin-orbit coupling. I will discuss the perspectives opened by this new field of research sometimes called “oxide interface engineering”.



[1] “When oxides meet face to face.” E. Dagotto, *Science* 318, 1076 (2007).

[2] “Enter the oxides.” J. Heber, *Nature* 459, 28 (2009).

[3] “A high mobility electron gas at the  $\text{LaAlO}_3/\text{SrTiO}_3$  heterointerface.” A. Ohtomo, H. Y. Hwang, *Nature* 427, 423 (2004).

[4] “Superconducting interfaces between insulating oxides.” N. Reyren, S. Thiel, A. D. Caviglia, L. Fitting Kourkoutis, G. Hammerl, C. Richter, C. W. Schneider, T. Kopp, A.-S. Ruetschi, D. Jaccard, M. Gabay, D. A. Muller, J.-M. Triscone and J. Mannhart, *Science* 317, 1196 (2007).

[5] “Electric field control of the  $\text{LaAlO}_3/\text{SrTiO}_3$  interface ground state.” A. Caviglia, S. Gariglio, N. Reyren, D. Jaccard, T. Schneider, M. Gabay, S. Thiel, G. Hammerl, J. Mannhart, and J.-M. Triscone, *Nature* 456, 624 (2008).