Top-gating control of the 2-DEG at the LAO/STO interface

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Abstract

Transition metal oxides display a great variety of quantum electronic behaviors where correlations often play an important role. The achievement of high quality epitaxial interfaces involving such materials gives a unique opportunity to engineer artificial materials where new electronic orders take place. The recent discovery [1-3] of a superconducting two-dimensional electron gas (2DEG) at the interface of insulating oxides such as SrTiO3/LaAlO3 or LaTiO3/SrTiO3 provide a unique system in which superconducting to insulating transition can be continuously controlled using a back gate. In addition, those 2DEG present a field-effect-tunable strong Rashba spin-orbit coupling. Thus they naturally combine all the ingredients to host topological states.
In this presentation, we report the local control of superconducting properties and Rashba spin-orbit coupling with top gated [4,5], in device based on LaAlO3/SrTiO3 oxides interfaces. Finally, we will discuss the recent results on local control of the metallic 2DEG at even shorter scales with top gates in a quantum point contact geometry. This study paves the way for an accurate control of the 2DEG at oxides interfaces at mesoscopic scales.

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