

An emergent quasi-2D metallic state with heavily doped CuO₂ planes

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Abstract

Recent quasi-2D systems with judicious exploitation of the atomic monolayer or few-layer architecture exhibit unprecedented physical properties that challenge the conventional wisdom on matter. Infinite layer SrCuO₂ (SCO) is a topical Mott insulator. Here we show that such a model system can manifest an unexpected metallic state in the quasi-2D limit when SCO is simply grown on TiO₂-terminated SrTiO₃ (STO) substrates. The electrical transport properties indicate that this metallic system does not fit into Landau's paradigm of a Fermi liquid. X-ray absorption spectroscopy revealed characters analogous to those of a doped Mott insulator. The core element of hole doping is not at the interfaces between SCO and STO, but comes from the transient layer(s) between the chain-type and planar-type structures within the SCO sector as implied by an energy scan of x-ray Laue nano-diffraction.

Keywords – *Superconductivity, Heterostructures, Quasi-2D, Interface, heavily doped.*

