Evolution of Fermi surface sheets and multiple critical fields in bulk SrTiO3

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Abstract

In 1964, SrTiO3 became the first oxide known to become superconductivity. Decades later, this very restrictive club includes two other members, the cuprate family of high-temperature superconductors and Sr2RuO4. We present an experimental study of the normal and superconducting states in SrTiO3 focused on a quantitative determination of the Fermi surface sheets and the superconducting gaps. Below a critical doping, superconductivity survives in a single-band context, making the system, by far, the most dilute superconductor known yet. When the carrier density is a thousand times larger (i.e. near optimal doping), thermal conductivity detects the presence of multiple gaps by finding a characteristic field much smaller than the upper critical field. We argue that superconducting gaps detected by thermal conductivity and Fermi surface components detected by quantum-oscillation measurements can be linked to each other.

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