Evidence of weak superconductivity at the room-temperature grown LaAlO3/SrTiO3 interface

The two-dimensional electron gas at the crystalline LaAlO3/SrTiO3 (c-LAO/STO) interface has sparked large interest due to its exotic properties, including an intriguing gate-tunable superconducting phase. While there is growing evidence of pronounced spatial inhomogeneity in the conductivity at STO-based interfaces, the consequences for superconductivity remain largely unknown. We study interfaces based on amorphous LAO top layers grown at room temperature (a-LAO/STO) and demonstrate a superconducting phase similar to c-LAO/STO, however, with a gate-tunable critical temperature of 460 mK. The dependence of the superconducting critical current on temperature, magnetic field, and backgate-controlled doping is found to be consistently described by a model of a random array of Josephson-coupled superconducting domains.

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