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# Towards high-temperature quasi-two-dimensional superconductivity

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## Abstract

© 2018 American Physical Society. The demonstration of a quasi-two-dimensional electron gas (2DEG) and superconducting properties in LaAlO3/SrTiO3 heterostructures has stimulated intense research activity in the last ten years. The 2DEG has unique properties that are promising for applications in all-oxide electronic devices. The superconductivity in such heterostructures has been observed below 300 mK. For superconductivity applications it is desirable to have more wide temperature of the existence range and the ability to control superconducting properties by external stimulus. Based on first-principles calculations and theoretical consideration we show that all-oxide heterostructures incorporating a ferroelectric constituent, such as BaTiO3/La2CuO4, allow creating 2DEG. We predict a possibility of a high-temperature quasi-two-dimensional superconducting state. This state could be switchable between superconducting and conducting states by ferroelectric polarization reversal. We also discuss that such structures must be more simple for preparation. The proposed concept of a ferroelectrically controlled interface superconductivity offers the possibility to design novel electronic devices.

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