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M2Po2A-05 [29]: Research on Unconventional Pairing Mechanism at Superconducting LaAlO3/SrTiO3(110) Interface

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The transition metal oxide interface has attracted extensive attention due to its unique strong correlation properties. In particular, LaAlO3/SrTiO3(LAO/STO) interface [1], has a high mobility of two-dimensional electron gas (2DEG), and specific physical phenomena such as superconductivity [2,3], ferromagnetism [4], and the coexistence of superconductivity and ferromagnetism [5,6] have been observed.
In this study, LAO/STO oxide heterostructure interfaces were prepared by LMBE. The two-dimensional superconductivity of the LAO/STO interface was confirmed with critical temperature of about 200mK [3]. Due to the good dielectric properties of STO, the back-gate-voltage VG was used to regulate the superconductivity of the LAO/STO(110) interface. The experimental results [7] show that with the decrease of VG, the critical temperature has a dome-like shape, while the upper critical field Hc2 monotonically decreases. This relationship of independence between the variation of Tc and of Hc2 suggests that the Cooper pairing potential is stronger in the underdoped region and the coherence length increases with the increase of VG. The result is as for high temperature superconducting cuprates and it is different than for conventional low temperature superconductors.
In addition, possible coexistence of superconductivity and ferromagnetism was observed at the LAO/STO interface: magnetoresistance peaks were found near the zero magnetic field [6] The preliminary results show that the coexistence of superconductivity and ferromagnetism of 2DEG is not caused by phase separation, and its space wave function of superconducting pairing is likely of p-wave symmetry. On this basis, the relevant phase sensitivity experiments were carried out.

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