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Quasi-two-dimensional superconductivity in $FeSe_{0.3}Te_{0.7}$ thin films and electric-field modulation of superconducting transition CHENGUANG MEI, ZHU LIN, Tsinghua University, LINLIN WEI, ZHANGAO SUN, SHILONG WU, Chinese Academy of Sciences, HAOLIANG HUANG, University of Science and Technology of China, SHU ZHANG, CHANG LIU, YANG FENG, Tsinghua University, HUANFANG TIAN, HUAIXIN YANG, JIANQI LI, Chinese Academy of Sciences, YAYU WANG, GUANGMING ZHANG, Tsinghua University, YALIN LU, University of Science and Technology of China, YONGGANG ZHAO, Tsinghua University, COLLABORATIVE INNOVATION CENTER OF QUANTUM MATTER TEAM — Heterostructures composed of superconductors and ferroelectrics are important for studying the coupling between superconductivity and ferroelectricity, especially the modulation of superconductivity by ferroelectricity. We study the structural and superconducting properties of $FeSe_{0.3}Te_{0.7}$ (FST) thin films with different thicknesses grown on ferroelectric $Pb(Mg_{1/3}Nb_{2/3})_{0.7}Ti_{0.3}O_3$ substrates. The FST films undergo biaxial tensile strains which are fully relaxed for films above 200 nm, and the ultrathin and thicker films exhibit an insulating behavior and superconductivity, respectively. The current-voltage curves around the superconducting transition follow the Berezinskii-Kosterlitz-Thouless (BKT) transition behavior, revealing quasi-two-dimensional phase fluctuation. Upon applying electric field to the heterostructure, Tc of FST thin film increases due to the reduction of the tensile strain in FST. This work sheds light on the superconductivity, strain effect as well as electric-field modulation of superconductivity in FST films.

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