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**High  $T_C$  superconductivity in single-layer FeSe films on SrTiO<sub>3</sub>**<sup>1</sup>  
ZHANG WENHAO, WANG QINGYAN, LI FANGSEN, ZHANG JINSONG, GUO MINGHUA, Department of Physics, Tsinghua University, LIU DEFA, HE SHAO-LONG, The Institute of Physics, CAS, SUN YI, School of Physics, Peking University, HE KE, The Institute of Physics, CAS, CHEN XI, Department of Physics, Tsinghua University, WANG LILI, The Institute of Physics, CAS, WANG JIAN, School of Physics, Peking University, WANG YAYU, Department of Physics, Tsinghua University, ZHOU XINGJIANG, MA XUCUN, The Institute of Physics, CAS, XUE QI-KUN, Department of Physics, Tsinghua University — The latest scanning tunneling spectroscopy and angle resolved photoemission spectroscopy of single-unit-cell FeSe films on SrTiO<sub>3</sub> show signatures of high temperature superconductivity with  $T_C > 55$  K, the maximum value that has been stagnant since the discovery of the iron-based superconductors in 2008. Here we report a detailed transport study of the single-unit-cell FeSe film. Electrical transport measurements reveal a transition temperature of  $\sim 50$  K. The robust superconductivity is further confirmed by measuring Meissner effect. We show that the characteristics of the transition are consistent with a two-dimensional superconductor undergoing a Berezinskii-Kosterlitz-Thouless transition.

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