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Doping Evolution of Electronic Structure and Superconductivity in FeSe/SrTiO₃ Films BING SHEN, YONG HU, DEFA LIU, JIANWEI HUANG, AIJI LIANG, YU XU, LIN ZHAO, SHAOLONG HE, Institute of Physics, Chinese Academy of Sciences, LILI WANG, XUCUN MA, QIKUN XUE, State Key Lab of Low-Dimensional Quantum Physics, Department of Physics, Tsinghua University, CHUANGTIAN CHEN, ZUYAN XU, Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, XINGJIANG ZHOU, Institute of Physics, Chinese Academy of Sciences — The latest discovery of high temperature superconductivity in FeSe/SrTiO₃ film has attracted extensive attention. Our previous ARPES studies on the single-layer and double-layer FeSe/SrTiO₃ films showed that, it is possible to transform single-layer FeSe/SrTiO₃ films from N-phase to S phase by vacuum annealing and get superconductivity with a high T_c over 65K. We also showed that it is hard to get double-layer FeSe/SrTiO₃ films doped and it remains in the semiconducting/insulating state under an extensive annealing condition. In this talk, we will present our new ARPES results on the FeSe/SrTiO₃ films with different layers (1UC, 2UC, 3UC and 20UC), especially for the 3UC-FeSe films. We use another method, potassium deposition, to increase the carrier concentration. As the result, we observed N phase to S phase transformation in FeSe/SrTiO₃ films with different layers. This systematic study will provide insight in understanding the evolution of electronic structure and superconductivity from the single-layer FeSe film, to multiple-layer FeSe film and eventually to the bulk FeSe superconductor.

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