Controlling superconductivity at the FeSe/SrTiO3 interface by interfacial electron density

WEIWEI ZHAO, Pennsylvania State University, CUI-ZU CHANG, MIT, JUE JIANG, Pennsylvania State University, JAGADEESH MOODERA, MIT, MOSES CHAN, Pennsylvania State University — Single layer iron selenide (FeSe) on SrTiO3 substrate with a possible superconducting transition temperature ($T_c$) above 100K has attracted a great deal of attention recently. An important outstanding puzzle in this system is the inconsistency in $T_c$ as measured by different techniques. Here we systematically study the dependence of $T_c$ on the electron carrier density in this system and found that $T_c$ can be most effectively enhanced by increasing the density of electron carriers directly at the FeSe/SrTiO3 interface. We believe that our result resolves some of the puzzles in previous experiments, and open the possibility for further enhancement of $T_c$ in this system even when taken outside the UHV chamber.

This research is supported by the NSF grants (DMR-1420620, Penn State MRSEC; in MIT by DMR-1207469 and the STC Center for Integrated Quantum Materials under NSF grant DMR-1231319) and by ONR Grant N00014-13-1-0301.