MAR15-2014-020156

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Interface-induced high-temperature superconductivity in FeSe/TiO_2(001) heterostructure

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The recently discovered high transition temperature (T_c) superconductivity at the interface of single unit-cell (UC) FeSe films on $SrTiO_3$(001) has generated considerable excitement [1,2], which may eventually lead to the discovery of a new family of high-T_c superconductors at many different interfaces. In this talk, we will present our recent work on a new interfacial system with high-T_c superconductivity, 1 UC FeSe films on anatase TiO_2(001). By using molecular beam epitaxy (MBE) techniques, we have successfully prepared high-quality 1 UC FeSe films on anatase TiO_2(001) formed on $SrTiO_3$. *In situ* scanning tunneling spectroscopy (STS) reveals large superconducting gap (Δ) ranging from 17 meV to 22 meV, which is nearly one order of magnitude larger than $\Delta = 2.2$ meV of bulk FeSe with $T_c = 9.4$ K, indicating the signature of high-T_c superconductivity. The superconductivity of this heterostructure system is further verified by imaging vortex lattice under external magnetic field. By examining the distinct properties of anatase TiO_2 from $SrTiO_3$, as well as their influences on superconductivity, we will also discuss about the possible pairing mechanism of this system. Together with our previous work of 1 UC FeSe/$SrTiO_3$ [1,2], this work demonstrates that interface engineering is a powerful way to fabricate new high-T_c superconductors and investigate the mechanism of high-T_c superconductivity.

[1] Q.-Y. Wang *et al.*, *Chin. Phys. Lett.* **29,** 037402 (2012).
[2] W.-H. Zhang *et al.*, *Chin. Phys. Lett.* **31,** 017401 (2014).