Department of Physics
Condensed Matter Physics
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UNIVERSITY OF OXFORD

CONDENSED MATTER SPECIAL SEMINAR

Friday 26 January 2018 at 11:30am

"Superconductivity in Crytalline 2D Superconductors and Tip Induced Unconventional Superconductivity on Topological Materials"

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By direct transport and magnetic measurements, we firstly provide direct evidence for high temperature superconductivity in the 1-UC FeSe films grown on insulating STO substrates with the onset Tc and critical current density much higher than those for bulk FeSe.[1] Furthermore, thickness dependent of superconductivity is carefully studied and interesting phenomena, such as superconductor-insulator transition and linear magnetoresistance, are observed.[2-5] These investigations may pave the way to enhancing and tailoring superconductivity by interface engineering.[4] Quantum phase transition is one of most important topics in condensed matter physics. When we study the superconductor-metal transion in ultrathin cyrtalline Ga films grown on GaN substrate [6], for the first time quantum Griffiths singularity in two dimensional (2D) systems [7] is discovered as a new quantum phase transition in 2D superconductors. The coexistence of quantum Griffiths singularity and Ising superconductivity is further revealed in monolayer NbSe2 films[8].

Due to its potential application in topological quantum computation, topological superconductivity has become one of the most important topics in condensed matter physics and material science. By using hard point contact (tip) measurements [9], the unconventional superconductivity on the surface of single crystalline 3D topological Dirac semimetal Cd3As2 [10] is induced by the tip with some signatures showing the possibility of topological superconductivity.[11] Furthermore, the unconventional superconductivity on Weyl semimetal TaAs is also discovered by using same method.[12] Thus, a new way to realize and detect topological superconductivity has been developed.

References

[1] Chin. Phys. Lett. 31, 017401 (2014) (with a higlight: Science 343, 230 (2014)), [2] Scientific Reports 4, 6040 (2014), [3] 2D Materials 2, 044012 (2015), [4] J. Phys.: Condens. Matter 29, 153001 (2017), [5] 2D Materials 4, 034004 (2017), [6] Physical Review Letters 114, 107003 (2015) (Editors' Suggestion), [7] Science 350, 542 (2015) (with a perspective article: Science 350, 509(2015)), [8] Nano Letters 17, 6802 (2017), [9] npj Quantum Materials 1, 16005 (2016),
[10] Physical Review X 5, 031037 (2015)
[11] Nature Materials 15, 38 (2016)
[12] Science Bulletin 62, 425 (2017) (Cover Story)

Host: Prof Yulin Chen
Audrey Wood Seminar Room, Clarendon Laboratory