Field Effect Control of Quantum Phases

J. T. Ye

Zernike Institute for Advanced Materials
University of Groningen, The Netherlands

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Abstract

Field effect control of ion movement was recently proved to be an effective way to dope various materials electrostatically. By introducing a so-called electric double layer transistor, the electrochemical version of a conventional field effect transistor (FET), highly efficient FETs can be made with the capability of accumulating dense carriers (~10^{14} cm^{-2}) mediated by movement of organic ions at transistor channel surface, which is attracting growing interests in the field of quantum phase control of many materials. In this talk, I will present an overview on the experimental efforts using ionic gating as an effective tool to control metal-insulator transition, superconductivity, and ferromagnetism, which will be followed by recent new results of observing competing Rashba and Zeeman type effective magnetic fields originated from ionic gating, which not only create strong electric field but also break the out-of-plane inversion symmetry of layered semiconducting transition metal dichalcogenides. By applying this method to a broader range of materials (for instance, varieties of thin films and single crystals), this organic/inorganic interface is promising to act as a rich playground for novel electronic properties and an emerging source of new device functionalities.

References

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About the Speaker

Education

Department of Physics, Hong Kong University of Science and Technology, Hong Kong
• 2004.9 - 2006.8 Doctor of Philosophy (in Physics)
• 2000.9 - 2002.8 Master of Philosophy (in Physics)
Department of Physics, Zhejiang University, Hangzhou, China
• 1996.9 – 2000.6 Bachelor of Science (in Physics)

Employments

Zernike Institute for Advanced Materials, University of Groningen
Associate Professor 2013. 11 – present
Center for Emergent Matter Science, RIKEN
Senior Research Scientist 2013. 7 – 2013. 10
Quantum-Phase Electronics Center and Department of Applied Physics,
The University of Tokyo