



Field Effect Control of Quantum Phases

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663

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 ($\sim 10^{14} \text{ cm}^{-2}$) 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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- 2 J. M. Lu, O. Zheliuk, I. Leermakers, Noah F. Q. Yuan, U. Zeitler, K. T. Law, and J. T. Ye, of two-dimensional Ising Superconductivity in Gated MoS_2 *Science* 350, 1353 (2015).
- 3 J. T. Ye, Y. J. Zhang, R. Akashi, M. S. Bahramy, *et al.*, Dome in a Gate Tuned Band *Science* 338, 1193 (2012).

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

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