Weekly Seminar

Melting the Correlated Electron Solid by Electric Fields -- Mott Transition in Ruthenium Oxide

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Time: 4:00pm, March. 30, 2016 (Wednesday)

时间: 2016年3月30日 （周三）下午4:00

Venue: w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Interactions among the electrons due to Coulomb repulsion are the key to the emergence of high-temperature superconductivities and multiferroic phenomena in the 3d-electron materials such as cuprates, manganites and iron-pnictides. Transition-metal oxides based on 4d and 5d electrons, such as ruthenium and iridium oxides, are also attracting a lot of current research interests because of the additional interplay between such electron correlations and spin-orbit interactions.

In this talk we feature the ruthenium oxides (ruthenates). After a very brief review on the superconductivity of Sr_2RuO_4, we will present on new phenomena in the Mott insulator Ca_2RuO_4. The Mott insulator is considered as an electron "solid" frozen due to strong correlations. It has a potential to become a good metal if the electron solid melts by suitable stimuli. In this talk, we will describe novel phenomena we found in the layered ruthenium oxide (ruthenate) Ca_2RuO_4, for which non-equilibrium conditions trigger and maintain the charge "liquid" state down to low temperatures [1].

This work is mainly done in collaboration with C. Sow[1], S. Yonezawa and F. Nakamura.

[1] *"Electric-field-induced metal maintained by current of the Mott insulator Ca_2RuO_4"*, F. Nakamura, M. Sakaki, Y. Yamanaka, S. Tamaru, T. Suzuki, and Y. Maeno, Sci. Rep. **3**, 2536 (2013).

About the Speaker

Yoshiteru Maeno was born in Kyoto. He obtained his B. Sc. (1979) degree from Kyoto University, and M. Sc. (1980) and Ph. D. (1984) degrees from the University of California, San Diego. He was a research associate (1984-89) and an associate professor (1989-96) at Hiroshima University. Then he became an associate professor (1996-2001) and a professor (2001- present) at Kyoto University. He worked as an assistant to Dr. J.G. Bednorz (1988-89) at IBM Zurich Laboratory. He received Bernd Matthias Prize in 2009.

The topics he studied include: thermal convection and chaos in helium superfluids, magnetism and superconductivity in heavy-fermion compounds, substitution effects in cuprate high-temperature superconductors, and spin frustrations in spin ice. In particular, his group discovered superconductivity in Sr_2RuO_4 in 1994 and has investigated unconventional superconductivity and metal-insulator transitions in various ruthenates. Currently, his main research interest is the exploration of the physics of topological quantum phenomena.