Department of Quantum Materials
Max Planck Institute for Solid State Research

qmat

OXFORD INSTRUMENTS
The Business of Science®

The Sir Martin Wood Prize Lecture

Pseudo-gap state of cuprate high-T_c superconductors studied by angle-resolved photoelectron spectroscopy

Dr Takeshi Kondo
Associate Professor
The Institute for Solid State Physics. The University of Tokyo

Biography

2005.3. Ph.D
Department of Crystalline Materials Science, Nagoya University.

2005.4.-2006.3 Postdoctoral research associate, Department of Physics, Massachusetts Institute of Technology, USA

2006.4.-2011.3 Postdoctoral research associate, Ames Laboratory and Department of Physics and Astronomy, Iowa State University, USA

2011.4.-2014.1 Postdoctoral research associate, Institute for Solid State Physics, The University of Tokyo

2014.2.- present Associate professor, The Institute for Solid State Physics, The University of Tokyo

SIR MARTIN WOOD PRIZE LECTURE

www.oxinst.com/scienceprizes

Dr. Takeshi Kondo
Associate Professor
The Institute for Solid State Physics, the University of Tokyo

Tuesday 5th October 2021, 11:00 am
Webinar

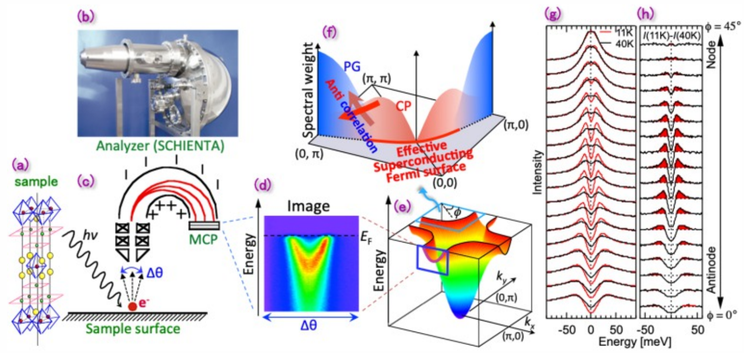
Login data will be announced by e-mail.

Virtually hosted by Max Planck Institute for Solid State Research, Stuttgart (Germany)

Superconductors characterized by zero resistivity have numerous technological applications, such as magnetic resonance imaging (MRI), and experiments have been conducted for the future to improve the performance of wind power generators or on a larger scale to build the infrastructure to transmit electricity around the world using power lines with no energy loss. Perhaps, the most exciting application may be Superconducting Magnetic Levitation Railway, planned to become operational in 2027 in Japan; the technology utilizing superconductors will finally become visible in our daily lives.

The conventional superconductors need to be cooled to cryogenic temperatures close to absolute zero. The copper oxide superconductors with a high critical temperature (high-T_c cuprates) can function at temperatures even above 100K, higher than the liquid nitrogen temperature. Last year, room-temperature superconductivity was reported to be realized in a simple compound containing hydrogen, sulfur, and carbon. However, it is achieved only under extremely high pressure like obtained at the core of the earth. Cuprates, therefore, still hold the record of the highest T_c achievable at the ambient pressure crucial for an actual application.

Although the goal of fundamental physicists studying cuprates is certainly to find the mechanism of high-T_c superconductivity accepted by all, that is not everything. These compounds have rich physical properties which have been fascinating researchers since their discovery more than 30 years ago. High-T_c superconductivity in cuprates occurs by a carrier doping to a Mott insulator, that is the insulator established in the extreme condition where electrons are localized to stop their conduction due to the Coulomb repulsion among them. The related electron correlation effect has been thought of as the main source leading to complicated yet fascinating properties of cuprates. In the webinar, I will share the fascination of cuprates by introducing the anomalous electronic properties standing out under the strong electron correlation effect. In particular, I use angle-resolved photoemission spectroscopy, a very powerful technique to directly observe the electronic structure of matters, and reveal the properties of enigmatic states in cuprates, called "pseudogap" and "small Fermi pocket".



Associate Professor Kondo was awarded the Sir Martin Wood Prize at the Millennium Science Forum which took place in November 2020. The Millennium Science Forum was established in 1998 to promote scientific exchange between Britain and Japan and recognize the work of outstanding young Japanese researchers. The prize is named after Sir Martin Wood, founder of Oxford Instruments.