

## Recent Progress on Spectroscopies and High- $T_c$ Superconductors

*In this workshop, we discuss the prospect of future development in the quantum beam spectroscopy with selecting the cuprate and iron-based high- $T_c$  superconductors as main target systems. Various views among experimental and theoretical studies have been exchanged. We confirmed the importance of complementary use of quantum beam spectroscopy to clarify the peculiar charge and spin dynamics.*

The international workshop “Recent Progress on Spectroscopies and High- $T_c$  Superconductors” was held on August 9<sup>th</sup>-11<sup>th</sup>, 2010 in Lecture Hall of Institute for Materials Research (IMR), Tohoku University. This workshop aimed to discuss the recent progress on condensed matter physics brought by quantum beam spectroscopy measurements. Main topic was superconductivity in the iron-based superconductors and high- $T_c$  cuprates, for which various challenging experimental and theoretical techniques are adapted to clarify exotic electronic states in these materials. Especially, the mechanism of superconductivity in Fe-based compounds, which was discovered by Hosono group in Japan [1], has been attracted much attention due to the possible novel physics and possibility of higher- $T_c$  in related materials. In addition to the discovery of new compounds, the world top-class experimental facilities such as synchrotron radiation facility (SPring-8) and high intensity proton accelerator facility (J-PARC) provide a great opportunity to elucidate the overall picture of electronic states in intriguing materials. Therefore, the broad discussion on recent progress of quantum beam spectroscopy is very important for the new era of condensed matter physics.

There were 35 oral presentations (28 experimental and 7 theoretical works) and 90 researchers participated in the work-



Fig. 1. A picture of workshop. 90 researchers including many young scientists participated in the workshop and exchanged the information.

shop. We invited 11 outstanding speakers from abroad, who introduced many new results and overviews on superconductors. The research results in the exciting field of iron related materials were discussed to share what are important issues to reveal the high- $T_c$  mechanism in this system. The complementary use of quantum beam spectroscopy, e.g. neutron, X-ray, Raman, photoemission, STM/STS, NMR, and  $\mu$ -SR, was also discussed, since it is necessary to study the multi-structure of the electronic states in the real, momentum and energy spaces. The participants actively discussed and exchanged the information during the workshop. We summarized huge amount of information on transition metal based superconductors and contributed to extract essential points among them. A booklet collecting slides presented in this workshop was distributed to the participants and the information benefits researchers on above subjects. This workshop received favorable impressions and opinions from the participants.

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- 4) Advanced Science Research Center, Japan Atomic Energy Agency.

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### References

- [1] Y. Kamihara et al., J. Am. Chem. Soc. 130, 3296 (2008).

### Key Words

Quantum Beam spectroscopy, neutron-scattering, J-PARC, SPring-8, High- $T_c$  superconductor, Iron Pnictide superconductor

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