Spectroscopic analyses From far IR to hard X-ray

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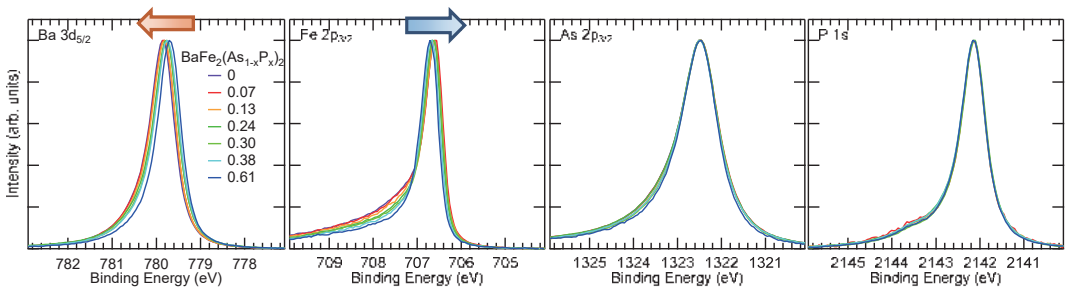
Background

- Newly discovered materials show various functions.
- To understand the mechanism, electronic structure is often the key issue.
- To evaluate the electronic structure, spectroscopy is very useful.

Aim

- Evaluation of the electronic structure by using spectroscopic techniques in very wide energy range from far IR to hard X-ray

Advanced Research Topics



Hard X-ray photoemission measurements of iron based superconductor $BaFe_2(As,P)_2$ @BL15XU in SPring-8

- Substitution of As site by P (isovalent substitution) induces superconductivity. We found modulation of the electronic structure by substitution.
- Core level shift of Ba $5d_{5/2}$ can be explained by Madelung potential (structure driven).
- To understand the core level shift of Fe $2d_{3/2}$, hybridization between Fe and anions (As/P) is important.
- The electronic structure of anions are hardly affected by the substitution.

Publications

- S. Tsuda *et al.*, Phys. Rev. B **87**, 241107 (2013).
- S. Tsuda *et al.*, J. Phys. Soc. Jpn. Conf. Proc. **3**, 013007 (2014).
- S. Tsuda *et al.*, J. Phys. Soc. Jpn. **86**, 053702 (2017).

Summary

- We directly found the substitution effect on the electronic structure of iron based superconductor $BaFe_2(As,P)_2$.
- To understand the substitution effect on the core level shift, both of the electronic structure and the crystal structure are important.

Research outcome

- Spectroscopy will give us rich information about the electronic structure. And the present results indicates that this technique can be applied to other materials.