Electronic Structure of the Heusler-type Compound $Ru_{0.5}Fe_{1.5}CrSi$ Studied by Hard X-Ray Photoelectron Spectroscopy

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Heusler-type ternary compounds have attracted much attention owing to their predicted half-metallic electronic structures. This class of compound is regarded as a key material for a promising application to next generation spintronics devices. However, the magneto-resistance ratio of magnetic tunneling junctions with these compounds show much smaller values than expected, which might be partly due to an anti-site defect. Recently, $Ru_{2-x}Fe_xCrSi$ has been predicted to hold a high spin polarization even if the anti-site defect would exist [1]. Motivated by this prediction, the samples with several Fe compositions have been fabricated and turned out to show ferromagnetism with rather high Curie temperature [2]. Here we present a research on the experimental evaluation of electronic structure probed by photoelectron spectroscopy. The valence band photoemission spectra have been taken with the brilliant synchrotron radiation in the hard X-ray region (3500-8000eV). We find the best agreement between the experimental and theoretical DOS if the Fe-Cr anti-site defect is considered, with keeping the higher spin polarization above 80% at E_F as shown in Fig.1. We have thus confirmed that $Ru_{0.5}Fe_{1.5}CrSi$ can be one of the most promising materials with high spin polarization.

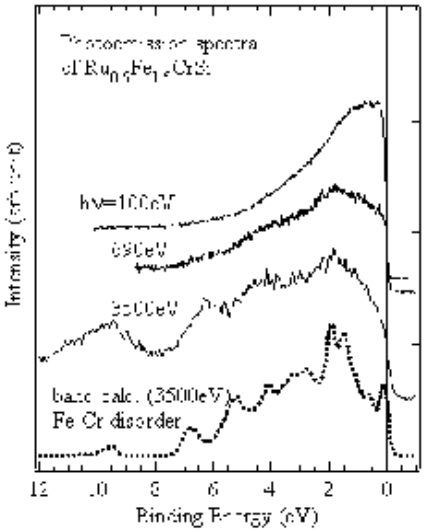

Fig.1.

[1] S. Mizutani et al., Mater. Trans. **47** (2006) 25.
[2] K. Matsuda et al., J. Phys.: Condens. Matter **17** (2005) 5889.