

High resolution, high energy, resonance photoemission spectroscopy of Kondo Ce compounds

S. Suga*(1250), A. Sekiyama(1256), S. Imada(1257), Y. Saitoh(278)¹,
 S. Ueda(1203), H. Harada(1207), T. Matsushita(1154)¹, T. Nakatani(345)¹,
 T. Iwasaki(1259), K. Matsuda(3560), M. Kotsugi(1254), T. Miyahara(3420)²,
 M. Fujisawa(3575)³, T. Kakabatake⁴, T. Yoshino⁴, D. T. Adroja⁴ and T. Nanba⁵
 Faculty of Engineering Science, Osaka University; SPring-8¹; Faculty of Science,
 Tokyo Metropolitan University²; ISSP, University of Tokyo³; Faculty of Science,
 Hiroshima University⁴; Faculty of Science, Kobe University⁵

High resolution soft X-ray beamline, BL25SU, is constructed in order to perform photoemission, photoelectron diffraction and magnetic circular dichroism studies. The details of the twin helical undulator and the optics, and the layout of the end stations are described elsewhere¹. For high resolution photoemission studies, a GAMMADATA-SCIENTA SES-200 hemispherical electron spectrometer is used. The experimental resolution of 0.22 eV estimated from the Fermi cut-off of Au has been so far obtained for a light source of BL25SU at $h\nu = 854$ eV. Further improvement of the photon monochromator is under the way.

Many Ce compounds have much attracted wide interest due to their rather localized Ce 4f states hybridized with valence-band states. We have measured “bulk-sensitive” Ce 3d-4f resonant high resolution photoemission spectra of a Kondo Ce compound using the instruments mentioned above in order to investigate the Ce 4f electronic states. The sample was CePdSn, where the Ce ions are almost trivalent, and thus the Ce 4f states are rather localized. Figure 1 shows the Ce 3d-4f resonant photoemission spectra. The spectrum at $h\nu = 882.5$ eV corresponds to the resonance-maximum while that at $h\nu = 875$ eV corresponds to the resonance-minimum.

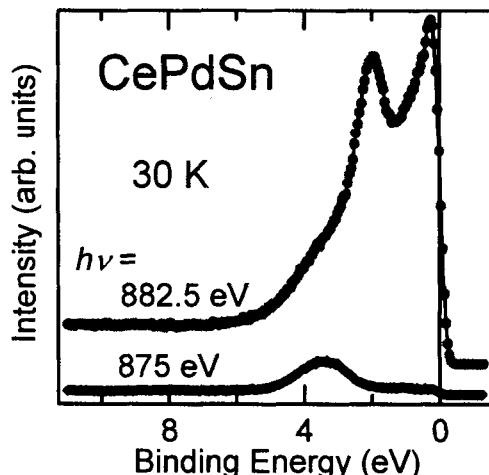


Fig. 1 Ce 3d-4f resonant photoemission spectra of CePdSn.

A well- (poorly-) screened peak is observed near E_F (around 2 eV) in the resonance-maximum spectrum. In the resonance-minimum, there is a relatively weak peak at 3.5 eV, originating from the Pd 4d contribution. The resonance-maximum spectral line-shape remarkably disagrees with the previously reported “surface-sensitive” Ce 4d-4f resonant spectrum², implying that the Ce 4f states in the bulk are considerably different from those in the surface for CePdSn.

1. Y. Saitoh *et al.*, J. Synchrotron Rad. **5** (1988) 542.
2. S. Nohara *et al.*, Phys. Rev. B **47** (1993) 1754.