# Core-Level Photoemission of the Single Crystal $Ce_2Pt_6Ga_{15}$

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$Ce_2Pt_6Ga_{15}$ has a hexagonal crystal structure with the space group $P6_3/mmc$, which has additional disorder [1]. $Ce_2Pt_6Ga_{15}$ is characterized as one of the strongly correlated electron systems in which Coulomb interaction between electrons plays important roles [2]. In order to understand the mechanisms of such properties, it is important to study Ce 4f electronic states in detail.

As a preliminary step, we conducted x-ray photoelectron spectroscopy (XPS) experiment on a single crystal sample of $Ce_2Pt_6Ga_{15}$. We used two different X-ray sources, Al Kα (1486.7 eV) and Cr Kα (5414.7 eV). Based on the relationship between photon energy and electron mean free path, Cr Kα source provides information of electrons at deeper part of the sample.

The XPS measurements were carried out at SA-1 of SR Center in Ritsumeikan University using the scanning soft and hard X-Ray photoemission apparatus. A single crystal of $Ce_2Pt_6Ga_{15}$ was fractured in vacuum before measurement.

Figures 1 to 3 show the Ce 3d, Pt 4f and Ga 2p spectra, where the spectra plotted by green and purple lines were measured by Al Kα and Cr Kα sources, respectively. The Ce 3d line shape is constructed of multiple final states; the main components are the $f^1$ features found in the energy regions of 880-890 eV and 900-910 eV and $f^2$ shoulders found around 878 end 897 eV. This indicates that electrons are transferred between the Ce 4f orbital and the ligand orbital in the final state. The Ce 3d peaks measured by Al Kα source is broadened toward the high energy side compared to those measured by Cr Kα source. On the other hand, such characteristics were not observed for Pt and Ga core levels. This suggests that Ce atoms on the surface tend to be oxidized. In addition, the ratio of the peak areas of the three spectra was consistent with the composition ratio of the sample.

As a next step, investigation of the anisotropy of the Ce 4f electronic state is very important for understanding the mechanisms of various physical properties of $Ce_2Pt_6Ga_{15}$.

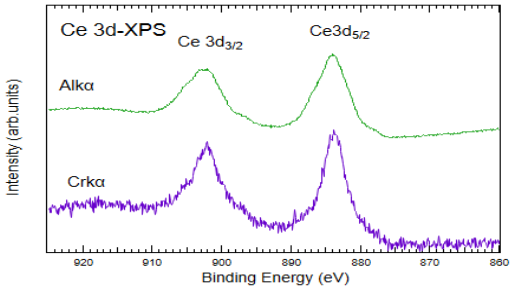


**Fig. 1** Ce 3d-XPS of $Ce_2Pt_6Ga_{15}$ measured by Al and Cr Kα sources.

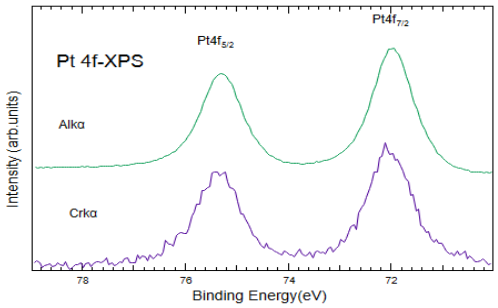


**Fig. 2** Pt 4f-XPS of $Ce_2Pt_6Ga_{15}$ measured by Al and Cr Kα sources.

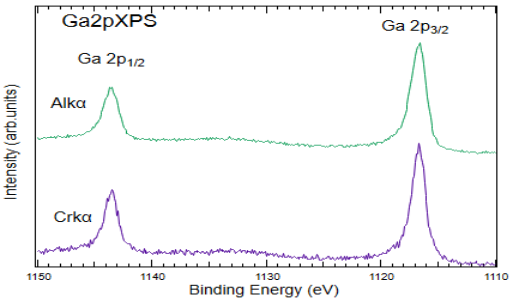


**Fig. 3** Ga 2p-XPS of $Ce_2Pt_6Ga_{15}$ measured by Al and Cr Kα sources.

## References

[1] G.H.Kwei, et al, *Acta.Cryst. B*, **1996**, *52*, 580.
[2] T. Yamashita and S. Ohara, *J. Phys: Conf. Ser.*, **2000**, *40*, 042074.