LOCAL STRUCTURE AROUND CERIUM DOPED IN Y-AL-O SCINTILATING MATERIALS

Xiaomei Guo, Kenji Sakurai, Andre Douy* and Claude Landron*

National Research Institute for Metals, Sengen 1-2-1, Tsukuba, Ibaraki 305-0047, Japan

*Centre de Recherches sur les Matériaux à Hautes Températures, 45071 Orléans cedex 2, France

Introduction

Yttrium aluminum perovskite ($YAlO_3$, YAP) activated by Ce has been known as a new important X-ray scintillator [1], which generates luminescence of 380 nm. During our research [2], it has been found that the luminescence intensity and other features of the spectra sometimes depend on the synthesizing methods. To understand the detailed mechanism of the luminescence generation, the local structure around doped Ce in $YAlO_3$ has been studied by EXAFS.

Experimental

YAP:Ce samples have been synthesized by two different synthesizing procedures, soft-chemistry [3] and ball-milling methods [2]. Although the concentration of Ce for soft-chemistry (ca. 1 at%) is higher than ball-milling procedures (ca. 0.5 at%), the luminescence intensity is rather weak; it was about a half of that of ball-milling method. In the case of ball-milling, another weak peak at 580 nm (about 1/16 intensity of the main 380 nm peak) was observed. The EXAFS data at Y-K and Ce-LIII edges have been collected at room temperature on the BL10B and BL9A, respectively.

Results and Discussion

Figure 1 shows magnitude of Fourier transform for the EXAFS at Y-K (a) and Ce-LIII (b) absorption edges. The local structure around Y is almost identical for both two methods. It has been confirmed that atomic arrangement around Y agrees well with the crystallographic data for YAP. On the contrary, Ce-LIII data indicate quite different structure between the samples prepared by two methods. While Ce atoms occupy dominantly the Y sites for the soft-chemistry sample, in the case of ball-milling, it has been found that Ce atoms are located not only at Y sites but also at Al sites. The difference of the local-structure around Ce could correlate the luminescence spectra. Further studies are under way.

The authors would like to thank Dr. M.Harada of Fukuoka University of Education for his assistance during the experiments.

References

[1] M.Harada et al., PF Activity Report #16 B, 292, 1998.
[2] K.Sakurai and X.Guo, Mater. Sci & Eng, A, in press.
[3] A.Douy and P.Odier, Mat. Res. Bull., **24**, 1129 (1989).

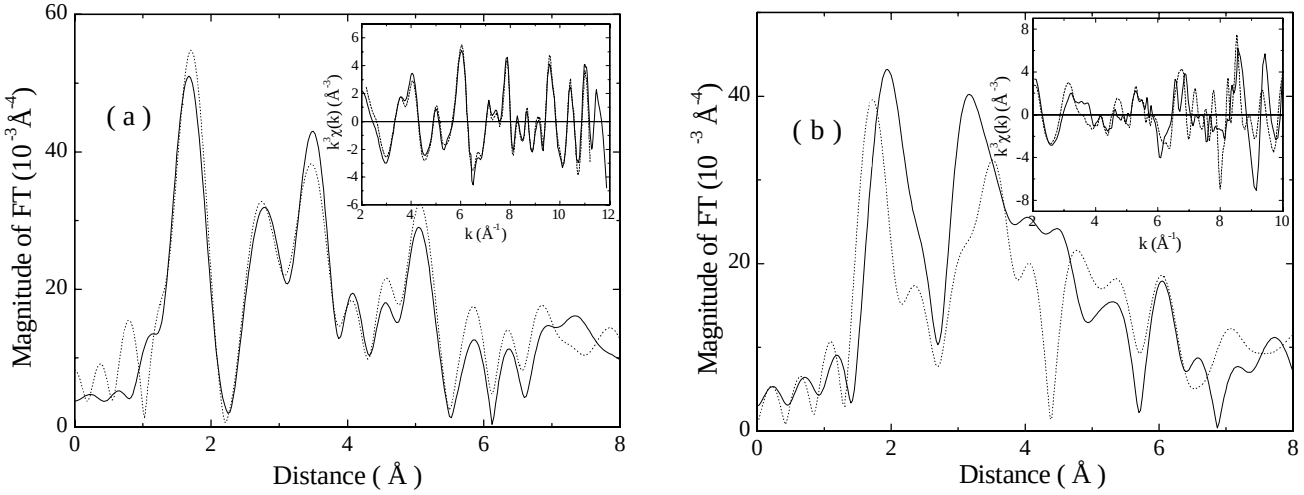

Fig. 1. Magnitude of Fourier transform of the EXAFS at Y-K (a) and Ce-LIII (b) absorption edges. Solid and dashed lines indicate ball-milling and soft-chemistry method, respectively.