**X-ray absorption fine structure study of La doped a red phosphor $SrIn_2O_4:Pr^{3+}$**

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$SrIn_2O_4:Pr^{3+}$ is a leading candidate as a red color phosphor for Field Emission Display (FED) free from Cd. However, its luminous efficiency is not high enough at present. Recently, we found that the luminous efficiency of $SrIn_2O_4:Pr^{3+}$ was increased by addition of Gd. On the other hand, the luminosity was decreased by La addition [1]. These contrastive effects suggest that the sites of these doped lanthanoids are different in the $SrIn_2O_4:Pr^{3+}$ crystals. We reported the doped Gd ions substitute for the In site in $SrIn_2O_4:Pr^{3+}$ from Extended X-ray Absorption Fine Structure (EXAFS) measurements [2]. In order to clarify the site of doped La ions in $SrIn_2O_4:Pr^{3+}$, we have performed La $L_3$-edge EXAFS analyses of $SrIn_2O_4$:La in this study.

XAFS experiments were carried out at the beamlines BL01B1 and BL19B2 at SPring-8. The incident X-ray was obtained by a double-crystal Si(111) monochromator. We measured La $L_3$-edge EXAFS of La(5mol%)-doped $SrIn_2O_4$ with fluorescence mode using a 19 elements Ge solid-state detector at room temperature. Sr and In K-edge EXAFS of $SrIn_2O_4$ and La $L_3$-edge EXAFS of $LaInO_3$ were measured with transmission mode as references. $LaInO_3$ is a lantanoide enriched phase separated from $SrIn_2O_4$ crystal. This phase was observed in the La(10mol%)-doped $SrIn_2O_4$ by X-ray diffraction. In the case of La(5mol%)-doped $SrIn_2O_4$ we considered that La solved predominately into $SrIn_2O_4$ crystal , since there is no detectable diffraction peak of $LaInO_3$.

Figure 1 shows La $L_3$-edge X-ray Absorption Near Edge Structure (XANES) spectra of $LaInO_3$ and $SrIn_2O_4$:La(5mol%). These spectra suggest that La in $SrIn_2O_4$:La is trivalent as $LaInO_3$.

Figure 2 shows $k^3\chi(k)$ at La $L_3$-edge of $LaInO_3$ and $SrIn_2O_4$:La(5mol%) and Gd $L_3$-edge of $SrIn_2O_4$:Gd(5mol%). EXAFS oscillations at La $L_3$-edge and Gd $L_3$-edge were observed up to 100 and 110 $nm^{-1}$, respectively. We conclude that there is no detectable contaminant of $LaInO_3$ in our $SrIn_2O_4$:La, The difference of EXAFS functions $SrIn_2O_4$:La and $LaInO_3$ also indicates the doped that La solved predominately into $SrIn_2O_4$ crystal. The EXAFS function of $SrIn_2O_4$:La is also remarkably different from that of $SrIn_2O_4$:Gd. This difference means that the site of doped La is different from those of In in $SrIn_2O_4$:La. This result is very interesting, since both In and the doped La are trivalent. Further discussions will be done in the meeting.

The XAFS experiments were performed at the Spring-8 with the approval of the Japan Synchrotron Radiation Research Institute (JASRI) (proposal No. 2003A-0872-RI-np-TU and 2004A-0579-NI-np-TU).

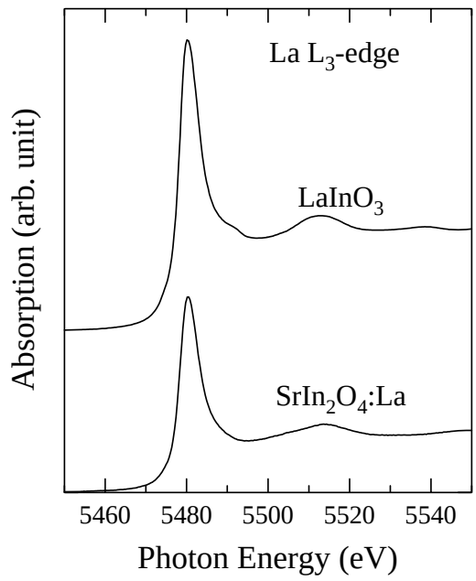


Fig. 1 La $L_3$-edge XANES spectra of $LaInO_3$ and $SrIn_2O_4$:La(5mol%)

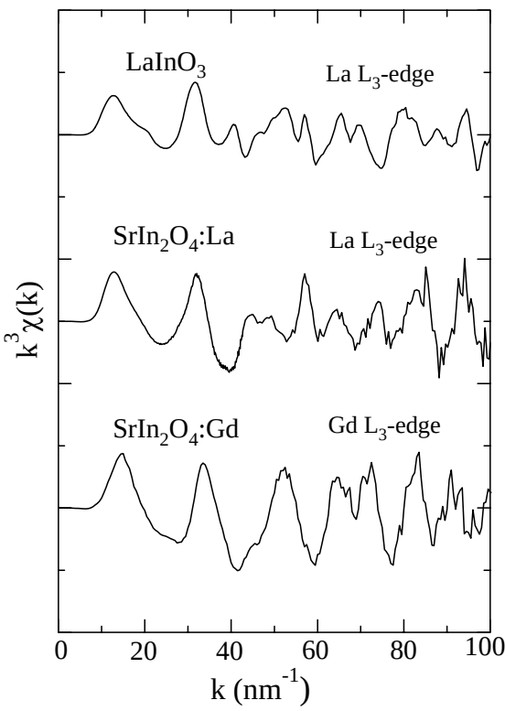


Fig. 2 $k^3\chi(k)$ at La $L_3$-edge of $LaInO_3$ and $SrIn_2O_4$:La(5mol%) and Gd $L_3$-edge of $SrIn_2O_4$:Gd(5mol%).

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[2] T. Honma, I. Hirosawa, K. Uheda, S. Abe and H. Yamamoto, Proceedings of The 10th International Display Workshops, p. 1711 (2003)