

11th International Conference on

ADVANCED MATERIALS & PROCESSING

September 07-08, 2017 | Edinburgh, Scotland

Encapsulation of oxynitride phosphors into sintered $\text{Li}_2\text{O-ZnO-B}_2\text{O}_3\text{-P}_2\text{O}_5\text{-CaF}_2$ glass body

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The conditions for the fabrication of transparent glass body in the $\text{Li}_2\text{O-ZnO-B}_2\text{O}_3\text{-P}_2\text{O}_5\text{-CaF}_2$ system were examined by a pressureless firing and subsequent oxygen-supplied hot isostatic pressing ($\text{O}_2\text{-HIP}$). The starting glass was prepared by melting the mixture of LiOH , ZnO , H_3BO_3 , H_3PO_4 and CaF_2 at 1100°C in air, followed by quenching on copper plates cooled by liquid nitrogen. The glass powder compact was pressurelessly-fired at 370°C for 1 h in order to remove the open pores, and the subsequent $\text{O}_2\text{-HIP}$ treatment at 370°C for 24 h under the pressure of 130 MPa made the clear light transmission possible, regardless of the formation of $\text{Ca}_2\text{P}_2\text{O}_7$ on the surface. The glass body obtained by firing at 370°C for 1 h and the subsequent $\text{O}_2\text{-HIP}$ treatment at 370°C for 24 h was hydrothermally-treated in water at 100°C for 1 h, and found that the mass loss of this body was as low as 0.25%, showing excellent water resistance. When the oxynitride phosphors, i.e., blue-emitting $(\text{La}_{0.96}\text{Ce}_{0.04})_3\text{Si}_8\text{O}_4\text{N}_{11}$ and yellow-emitting $(\text{Ca}_{0.97}\text{Eu}_{0.03})\text{Si}_2\text{O}_2\text{N}_2$, were encapsulated into the glass, no peak shifts in the emission/excitation spectra were found, which demonstrated that no significant degradation of phosphors has occurred during the encapsulation operation. Pseudo-white light emission was observed by the equi-mass addition (total amount: 3 mass%) of $(\text{La}_{0.96}\text{Ce}_{0.04})_3\text{Si}_8\text{O}_4\text{N}_{11}$ and $(\text{Ca}_{0.97}\text{Eu}_{0.03})\text{Si}_2\text{O}_2\text{N}_2$. Overall, the transparent glass body could be fabricated by the pressureless firing and subsequent $\text{O}_2\text{-HIP}$ treatment, and the phosphors were encapsulated into the glass without significant degradation.

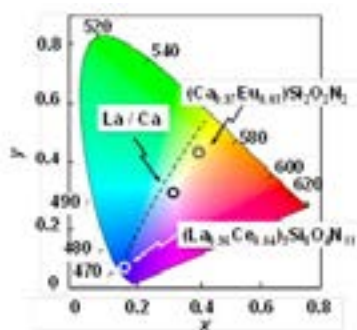


Figure 1: Chromaticity coordinate of glass body with $(\text{La}_{0.96}\text{Ce}_{0.04})_3\text{Si}_8\text{O}_4\text{N}_{11}$ and $(\text{Ca}_{0.97}\text{Eu}_{0.03})\text{Si}_2\text{O}_2\text{N}_2$ addition. Excitation WL \square 370 nm.

Biography

Nanako Akiyama is a student of Sophia graduate school. Her research interest is the luminescence properties of oxide, oxynitride and nitride phosphors, and the encapsulation technique of the phosphors in the glass.

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