Optical and radiation-induced luminescence properties of Sn-doped magnesium aluminoborate glasses.

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POSTER presentation

Abstract

Luminescent materials for radiation detections are mainly classified as two types: scintillators which convert ionizing radiation to thousands of visible photons immediately and dosimeters which accumulate the absorbed energy of radiation. In dosimeter materials, the absorbed energy is released by external stimulation of light (optically stimulated luminescence, OSL) or heat (thermally stimulated luminescence, TSL), and read out as luminescence whose intensity is proportional to the deposited energy in the material. So, they are utilized in personal dose monitoring [1].

In this study, we focused on the alkaline-earth borate glasses because of the high TSL properties of them [2,3]. We evaluated the basic optical and radiation induced luminescence properties of Sn-doped 30MgO-50B2O3-20Al2O3 glasses with various Sn concentrations synthesized by the melt quenching method. The photoluminescence (PL) spectra of the Sn-doped glasses are represented in Figure 1. A broad peak around 300-600 nm is observed, which is attributed to the T1-S0 relaxation of Sn2+. Figure 2 shows the PL decay time profiles, and the decay curves are approximated by the single exponential function. The decay time constants are about 4.5 μs, which are typical values of Sn2+.

References

Brief Biographical Notes
Daisuke Nakauchi received B.Eng. degree from Department of Chemical Science and Engineering, Faculty of Engineering Science, Osaka University, Japan in 2015. He is currently in the first year of Ph.D. program at the Graduate School of Materials Science, Nara Institute of Science and Technology (NAIST), Nara, Japan, specializing development of luminescent materials for ionizing radiation detectors.