Effects of sintering temperature variation on synthesis of glass-ceramic phosphor using rice husk ash as silica source

ABSTRACT

In this study, the authors attempted to propose the very first study on fabrication and characterization of zinc-boro-silicate (ZBS) glass-ceramics derived from the ternary zinc-boro-silicate (ZnO)0.65(B2O3)0.15(RHA)0.2 glass system through a conventional melt-quenching method by incorporating rice husk ash (RHA) as the silica (SiO2) source, followed by a sintering process. Optimization of sintering condition has densified the sintered samples while embedded beta willemite (β-Zn2SiO4) and alpha willemite (α-Zn2SiO4) were proven in X-ray diffraction (XRD) analysis. Field emission scanning electron microscopy (FESEM) has shown the distribution of willemite crystals in rhombohedral shape crystals and successfully form closely-packed grains due to intense crystallization. The photoluminescence (PL) spectra of all sintered ZBS glasses presented various emission peaks at 425, 463, 487, 531, and 643 nm corresponded to violet, blue, green, and red emission, respectively. The correlation between the densification, phase transformation, microstructure, and photoluminescence of Zn2SiO4 glass-ceramic phosphor is discussed in detail.

Keyword: Rice husk ash; Zinc-boro-silicate; Willemite; Structural; Luminescence