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## The effect of varying $\text{Cu}^{2+}$ concentration on the structure and optical properties of $\text{BaAl}_2\text{O}_4: x\% \text{Cu}^{2+}$ ( $0 \leq x \leq 1$ ) nano-phosphors prepared using the citrate sol-gel method

Thursday, 11 July 2019 15:00 (2 hours)

$\text{BaAl}_2\text{O}_4:x\% \text{Cu}^{2+}$  ( $0 \leq x \leq 1$ ) nano-powders were successfully synthesized via citrate sol-gel method. The X-ray diffraction (XRD) spectrum revealed that the prepared  $\text{BaAl}_2\text{O}_4:x\% \text{Cu}^{2+}$  samples consists of the hexagonal  $\text{BaAl}_2\text{O}_4$ . The estimated average crystallite sizes from the XRD and transmission electron microscopy (TEM) were found to be in the order of 20 nm. The energy dispersive X-ray spectroscopy (EDS) confirmed the presence of all expected elementary composition (Ba, Al, O and Cu). The scanning electron microscope (SEM) showed that varying the  $\text{Cu}^{2+}$  concentration influence the morphology of the prepared nano-phosphor. The photoluminescence (PL) showed the presence of both emissions from the host material and  $\text{Cu}^{2+}$ . Two emission peaks located at 440 – 500 and 616 nm were attributed to the intrinsic intraband gap defects within the host material, while the emission at 424 – 475 nm were attributed to arise from the  $3d^8s_1 \rightarrow 3d^9$  transition in  $\text{Cu}^{2+}$ . The critical energy transfer distance ( $R_c$ ) of  $\text{Cu}^{2+}$  ions was found to be 12.01 Å, suggesting that the multipole–multipole interaction (M-MI) caused the concentration quenching. The International Commission on Illumination (CIE) colour chromaticity showed that varying the  $\text{Cu}^{2+}$  doping concentration and excitation wavelength significantly influences the emission colour. Thermo stimulated luminescence (TSL) shows the present of two glow peaks at 90.5 and 100 °C for the host and doped sample, respectively.

Apply to be considered for a student award (Yes / No)?

No

Level for award (Hons, MSc, PhD, N/A)?

No

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