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The effect of varying Cu2+ concentration on the structure and optical properties of BaAl2O4: x% Cu2+ (0 ≤ x ≤ 1) nano-phosphors prepared using the citrate sol-gel method

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

BaAl2O4:x% Cu2+ (0 ≤ x ≤ 1) nano-powders were successfully synthesized via citrate sol-gel method. The X-ray diffraction (XRD) spectrum revealed that the prepared BaAl2O4:x% Cu2+ samples consists of the hexagonal BaAl2O4. 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 Cu2+ concentration influence the morphology of the prepared nano-phosphor. The photoluminescence (PL) showed the presence of both emissions from the host material and Cu2+. 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 3d84s1 ⟶ 3d9 transition in Cu2+. The critical energy transfer distance (Rc) of Cu2+ 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 Cu2+ 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 ℃ for the host and doped sample, respectively.

Apply to be
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No

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

No

Primary author: Prof. MOTLOUNG, Setumo Victor (SMU)

Co-authors: Mr KOAO, Lehlohonolo (UFS (Qwa Qwa Campus)); Mrs MHLONGO, Motlalepula Rebecca (Sefako Makgatho Health Sciences University); Prof. MOTAUNG, Tshwafo (University of Zululand); Mr MAPHIRI, Vusani Muswa (SMU)

Presenter: Prof. MOTLOUNG, Setumo Victor (SMU)

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