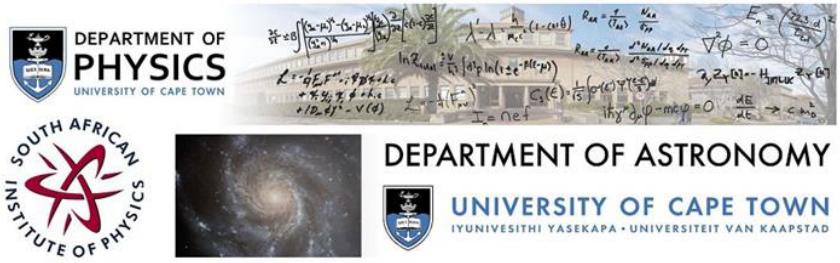

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Structural and luminescence properties of sol-gel derived BaMg2Al6Si9O30: Eu2+nanophosphors

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Abstract content
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Single phased Eu2+activated BaMg2Al6Si9O30 phosphors were synthesized by modified sol-gel combustion technique. The phase purity, particle sizes and luminescence properties of the prepared phosphors have been investigated systematically by using powder X-ray diffraction (XRD), transmission electron microscopy (TEM), and the photoluminescence (PL) techniques.In addition, the effects of annealing temperature and Eu2+ doping concentration on the PL intensities were also investigated. In order to understand the structure property relationship better, Rietveld refinement analysis has been performed for the BaMg2Al6Si9O30:Eu2+ phosphor.The phosphor showed only one blue emission band peaking at 494 nm under 325 nm near UV excitation, corresponding to the 4f65d1–4f7 transition of the Eu2+ ion. The results show that the phosphor has the highest emission intensity at 1 mol % of Eu2+ which should be considered as the quenching concentration. The XRD pattern of the as-obtained BaMg2Al6Si9O30 powder was perfectly indexed to hexagonal crystalline phase with lattice constants of a = 10.129 Å, b = 10.129 Å and c = 14.340 Å (JCPDS No.01-83-740). No peaks of any other phases or impurities were observed from the XRD patterns, indicating that the BaMg2Al6Si9O30 crystalline phase with high purity could be obtained using the present synthesis route. The average crystallite size obtained using Scherrer's equation was around 70 nm which was later confirmed by TEM. The concentration quenching mechanism due to dipole–dipole interaction has been studied and the critical energy-transfer distance was calculated to be ˜5.8 Å. The band gap of the synthesized phosphors was calculated from diffuse reflectance spectra using the Kubelka–Munk function. The PL characteristics of the prepared phosphor showed the excitation matched well with the solid state lighting excitation sources and emission in the blue region of the spectrum indicating that Eu2+activated BaMg2Al6Si9O30 nanophosphors may be applicable for solid state lighting with stable physical as well as chemical properties.

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