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Narrowband Ultraviolet B Emitting Gd Doped CaAl_2O_4 Phosphors - An ESR and Photoluminescence Study

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Abstract

Phosphors with the composition $\text{Ca}_{1-x}\text{Gd}_x\text{Al}_2\text{O}_4$ ($x = 0.0025$ to 0.09) were synthesized by a simple combustion route in a short time. The formation of the as-prepared combustion products was confirmed by the X-ray diffraction analysis, indicating the formation of a monoclinic phase. The PL spectroscopy assessment shows that with increasing Gd^{3+} concentration, the ultraviolet emission from Gd^{3+} at 314 nm (${}^6\text{P}_{7/2} \rightarrow {}^8\text{S}_{7/2}$) progressively enhanced. The Gd^{3+} -doped CaAl_2O_4 displays electron spin resonance signals with the effective g values at $g \approx 1.95$, 2.9 , and 3.7 . Additional lines were also observed at the approximate g values of ~ 2.2 and 5.3 . Gd^{3+} ion located in the distorted surroundings and experiencing relatively strong crystal field, give rise to low field lines. Distorted surroundings in the present system may result from the nearness of the charge compensator oxygen vacancies.

Keywords: Combustion; XRD; ESR; Gd^{3+} ions; CaAl_2O_4 ; Photoluminescence

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