

PROBING THE STRONTIUMTHIODISILICATE HOST WITH TRIVALENT CERIUM

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Abstract

Alkaline earth thiosilicates are interesting materials for luminescent applications. They can be doped with several rare earth ions, leading to visible light emission (1). Many different phases can be synthesized, often with several different crystallographic sites for the alkaline earth ion (2). Since doping elements such as Eu^{2+} and Ce^{3+} show an emission spectrum which is strongly dependent on the local environment, they can be used as probes for the alkaline earth site symmetry sites in thiosilicate hosts.

In strontiumthiodisilicate (SrSi_2S_5), in contrast to many other thiosilicates, there is only one site to be occupied by a luminescent ion, such as cerium or europium. As a result, we can use the excitation spectra of cerium in this host to extract information on the coordination and local symmetry of this site. Two different crystallographic models can be found in literature, one cubic model (Ribes (3) analogous to BaGe_2S_5) and one monoclinic model (Nakamura (4), space group C_2). Therefore, we compare both models and we investigate if both models are in accordance with the x-ray diffraction measurements and with the luminescence properties.

The typical spin-orbit split cerium emission of 465 nm and 515 nm is discussed.

References

- (1) P. F. Smet, K. Korthout, J.E. Van Haecke and D. Poelman Using rare earth doped thiosilicate phosphors in white LEDs: Towards low colour temperature and high colour rendering, *Materials Science and Engineering: B* 2008, 146, 264-268
- (2) A. B. Parmentier, P. F. Smet, F. Bertram, J. Christen and D. Poelman Structure and luminescence of $(\text{Ca,Sr})_2\text{SiS}_4:\text{Eu}^{2+}$ phosphors 2010, *J. Phys. D: Appl. Phys* 43, 085401
- (3) M. Ribes, J. Olivier-Fourcade, E. Philippot and M. Maurin; Etude Structurale de Thiocomposés à Groupement Anionique de Type Tétrane $\text{Na}_4\text{X}_4\text{S}_{10}$ ($\text{X} = \text{Ge,Si}$) et $\text{Ba}_2\text{Ge}_4\text{S}_{10}$. *J. Solid State Chem.* 1973, 8, 195-205
- (4) M. Nakamura, H. Kato, Y. Takatsuka, V. Petrykin, S. Tezuka and M. Kakihana ; Synthesis and luminescence of a Cyan-blue Thiosilicate-based Phosphor $\text{SrSi}_2\text{S}_5:\text{Eu}^{2+}$, *Journal of Information Display*, 2010, 11, 135-139