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材料合成及性能

掺Tb³⁺铝酸锌的共沉淀法制备及发光性能研究

耿延玲, 张鹏, 孙振海, 王兰兰, 匡少平

青岛科技大学 化学与分子工程学院, 山东 青岛 266042

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摘要：采用聚乙二醇200辅助的共沉淀法制备了ZnAl₂O₄:Tb³⁺绿色荧光粉。通过X射线衍射(XRD)、热重-差热(TG-DTA)和荧光光谱(FL)对合成的ZnAl₂O₄:Tb³⁺荧光粉进行了表征。XRD结果显示:合成产物为立方晶系的ZnAl₂O₄:Tb³⁺,形成良好晶体的最佳烧结温度为700℃,与TG-DTA的数据显示一致。ZnAl₂O₄:Tb³⁺的激发光谱由260~310 nm的宽带峰和一系列的锐线峰。发射光谱的主发射峰位于544 nm,对应于D₄-F₅的能级跃迁。研究发现Tb³⁺的掺杂浓度对样品发射峰的组成强度有着很重要的影响,在Tb³⁺的摩尔分数为5.8%时达到最大,继续增加Tb³⁺的浓度,出现浓度猝灭现象。

关键词：共沉淀法 ZnAl₂O₄:Tb³⁺ 发光性能

Preparation and Luminescence Properties of ZnAl₂O₄:Tb³⁺ Phosphors

GENG Yan-ling, ZHANG Peng, SUN Zhen-hai, WANG Lan-lan, KUANG Shao-ping

College of Chemistry and Molecular Engineering, Qingdao University of Science and Technology, Qingdao 266042, China

Abstract: ZnAl₂O₄:Tb³⁺ green phosphors were prepared by an improved co-precipitation method. The crystal structure, phase transition and luminescence properties of as-synthesized ZnAl₂O₄:Tb³⁺ phosphors were investigated by X-ray diffraction, TG-DTA and fluorescence spectrometer, respectively. XRD results indicate that the crystal structure of the phosphors is cubic phase of ZnAl₂O₄ and the best temperature for synthesis ZnAl₂O₄:Tb³⁺ with cubic structure is 700℃. The excitation spectrum is formed by a broad band (260~310 nm) and a series of sharp peaks. The emission spectrum is composed of several peaks, located at 490, 544, 590 and 624 nm, respectively. The main peak is at 544 nm which is contributed to Tb³⁺ ions transition from ⁵D₄ to ⁷F₅. It is found that Tb³⁺ concentration has a significant effect on the emission spectrum. When Tb³⁺ mole fraction is 5.8%, the green emitting is the strongest. However, When Tb³⁺ mole fraction is more than 5.8%, the luminescence intensity decreases.

Keywords: co-precipitation method ZnAl₂O₄:Tb³⁺ luminescence properties

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通讯作者: 匡少平

作者简介: 耿延玲(1975-),女,山东青岛人,主要从事功能材料的研究。E-mail: ylgeng@qust.edu.cn, Tel: (0532)84022681

作者Email: kuangshaoping@126.com

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