

### 论文摘要

中国有色金属学报

ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO

第18卷 第10期 (总第115期) 2008年10月

 [PDF全文下载]

文章编号: 1004-0609(2008)10-1879-06

## Eu<sub>0.12</sub>Y<sub>1.88-x</sub>M<sub>x</sub>O<sub>3-δ</sub> (M=Mg, Ca) 纳米晶的制备及光致发光性能

司 伟<sup>1</sup>, 姜 姐<sup>2</sup>, 高 宏<sup>1</sup>, 翟玉春<sup>3</sup>

(1. 大连交通大学 材料科学与工程学院, 大连 116028;  
2. 沈阳航空工业学院 材料科学与工程学院, 沈阳 110136;  
3. 东北大学 材料与冶金学院, 沈阳 110004 )

**摘 要:** 在超声波作用下以均匀沉淀法制备Eu<sub>0.12</sub>Y<sub>1.88-x</sub>M<sub>x</sub>O<sub>3-δ</sub> (M=Mg, Ca) 纳米晶荧光粉, 用X射线衍射仪(XRD)、透射电镜(TEM)、荧光光谱对其进行表征, 研究掺杂Mg<sup>2+</sup>、Ca<sup>2+</sup>对Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>纳米晶光致发光(PL)性能的影响。结果表明, 掺杂Mg<sup>2+</sup>后, Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>的PL发射强度减弱, 而掺杂Ca<sup>2+</sup>后Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>的PL发射强度得到明显增强, 掺杂浓度高至15%(摩尔分数)后仍具有优良的发光性能, 大大提高掺杂Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>纳米晶的猝灭浓度。样品Eu<sub>0.12</sub>Y<sub>1.78</sub>Ca<sub>0.10</sub>O<sub>3-δ</sub>具有最佳PL发射强度, 是未掺杂Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup>的2.4倍, 且色纯度显著提高。掺杂样品PL性能的增强可归因于Eu<sup>3+</sup>的电荷迁移带(CTS)与接近Y(4d+5s)导带处缺陷态的叠加, 与掺杂离子的电负性及掺杂离子后样品的晶粒尺寸、结构对称性有关。

**关键字:** 纳米晶; 均匀沉淀法; 光致发光; 掺杂

## Preparation and photoluminescence of nanocrystal Eu<sub>0.12</sub>Y<sub>1.88-x</sub>M<sub>x</sub>O<sub>3-δ</sub> (M=Mg, Ca)

SI Wei<sup>1</sup>, JIANG Da<sup>2</sup>, GAO Hong<sup>1</sup>, ZHAI Yu-chun<sup>3</sup>

(1. School of Materials Science and Engineering, Dalian Jiaotong University, Dalian 116028, China;  
2. School of Materials Science and Technology, Shenyang Institute of Aeronautical Engineering, Shenyang 110136, China;  
3. School of Materials and Metallurgy, Northeastern University, Shenyang 110004, China)

**Abstract:** The nanocrystal phosphor Eu<sub>0.12</sub>Y<sub>1.88-x</sub>M<sub>x</sub>O<sub>3-δ</sub> (M=Mg, Ca) was prepared by ultrasonic and homogeneous precipitation method. X-ray diffraction(XRD), transmission electron microscope (TEM) and fluorescence spectrum were employed to analyze the nanocrystal structures, lattice constants, grain sizes, particle morphology and photoluminescence (PL) properties of Eu<sub>0.12</sub>Y<sub>1.88-x</sub>M<sub>x</sub>O<sub>3-δ</sub> (M=Mg, Ca). The results show that the PL emission intensity of Y<sub>2</sub>O<sub>3</sub>:Eu<sup>3+</sup> decreases after doping Mg<sup>2+</sup> but increase remarkably after doping Ca<sup>2+</sup>. The nanocrystals have the good luminous efficacy as the Ca<sup>2+</sup> doped concentration is up to 15%(mass fraction), which increases the quenching concentration. The sample

Eu<sub>0.12</sub>Y<sub>1.78</sub>Ca<sub>0.10</sub>O<sub>3-δ</sub> has the best PL emission intensity and its emission peaks intensity is 2.4 times as that of the sample undoped and increases remarkably on color purity. From our results, the enhancement of PL properties by the Ca<sup>2+</sup> co-dopants is explained in terms of the creation of defect states near the Y (4d+5s) conduction band, which overlaps with the Eu<sup>3+</sup> charge transfer state (CTS). This enhancement is related to electronegativities of co-doped ion, grain size and symmetry of the sample doped.

**Key words:** nanocrystal; homogeneous precipitation method; photoluminescence; doped

版权所有：《中国有色金属学报》编辑部

地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-8876765, 8877197, 8830410 传真： 0731-8877197

电子邮箱： [f-ysxb@mail.csu.edu.cn](mailto:f-ysxb@mail.csu.edu.cn)