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发光学报
CHINESE JOURNAL OF LUMINESCENCE
中文核心期刊
主管：中国科学院
主办：中国科学院长春光学精密机械与物理研究所
中国物理学会发光分会
主编：申德振

发光学报 2013, 34(11) 1440-1445 ISSN: 1000-7032 CN: 22-1116/O4

材料合成及性能

Ce^{3+}和Mn^{2+}掺杂的$Ba_9(Y_{2-x}Sc_x)(SiO_4)_6$光谱特性和温度特性研究

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摘要： 采用高温固相法制备了$Ba_9(Y_{2-x}Sc_x)(SiO_4)_6:Ce^{3+},Mn^{2+}$($x$=0,0.5,1.0,1.5,2.0)样品。在该体系中,当Sc^{3+}含量从x=0逐渐增加至x=2时,Ce^{3+}的蓝光发射强度提高了1.7倍;同时,Mn^{2+}的红光发射强度提高了1.9倍,显示了优良的红光特性。样品的发射光谱和漫反射光谱表明,Ce^{3+}、Mn^{2+}发射强度的增加与Ce^{3+}吸收能力和Ce^{3+}向Mn^{2+}能量传递的提升有直接关系。研究了样品$Ba_9Sc_2(SiO_4)_6:Ce^{3+},Mn^{2+}$的热稳定性。随着温度的升高,$Mn^{2+}$的红光发射呈现先升后降的态势。当温度从室温升至488 K时,Mn^{2+}发射强度仅下降至室温时的84%,表现出优良的热稳定性。高亮的红光发射和优良的热稳定性表明该荧光材料可为紫外基白光LED提供良好的红色光源。

关键词： $Ba_9(Y_{2-x}Sc_x)(SiO_4)_6:Ce^{3+}$　Mn^{2+}荧光粉　光谱特性　热稳定性　白光LED

Luminescence and Thermal Properties of Ce^{3+}, Mn^{2+} Codoped $Ba_9(Y_{2-x}Sc_x)(SiO_4)_6$ Phosphors

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Abstract: $Ba_9(Y_{2-x}Sc_x)(SiO_4)_6:Ce^{3+},Mn^{2+}$ (x=0,0.5,1.0,1.5,2.0) samples are prepared by solid-state reaction. For this phosphor, with the gradually increased Sc^{3+} contents from x=0 to x=2, the blue emission intensity of Ce^{3+} for x=2 sample increases to 1.7 times and the red emission intensity of Mn^{2+} increases to 1.9 times. By monitoring the photoluminescence and diffuse reflection spectra, it reveals that the increases of the Ce^{3+} and Mn^{2+} emissions are directly related with the enhancement of the absorbance of Ce^{3+} and the energy transfer efficiency from Ce^{3+} to Mn^{2+}. The x=2 sample, $Ba_9Sc_2(SiO_4)_6:Ce^{3+},Mn^{2+}$, was chosen for further thermal properties investigation. With temperature increasing, the red emission of Mn^{2+} increases originally and then decreases. As the temperature reaches to 488 K, the intensity is as high as 84% of that at room temperature. The enhanced red luminescence and superior temperature stability indicate BSS:Ce^{3+},Mn^{2+} could be used for UV-based white LEDs as the red light source.

Keywords: $Ba_9(Y_{2-x}Sc_x)(SiO_4)_6:Ce^{3+},Mn^{2+}$　luminescence　thermal stability　white LED
收稿日期 2013-08-15 修回日期 2013-09-13 网络版发布日期
基金项目:
陕西省自然科学基础研究基金(2012JM1020);陕西省教育厅自然科学研究(12JK0977)资助项目

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