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材料合成及性能

$Ca_{0.8}La_{0.2-x-y}MoO_4$：$xTb^{3+}$, yEu^{3+}荧光材料的水热合成及多色发光性质

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摘要： 采用水热法制备了$Ca_{0.8}La_{0.2-x-y}MoO_4$:$xTb^{3+}$,$yEu^{3+}$ 荧光材料,并对其结构和发光性能进行了研究。X射线衍射(XRD)分析表明,合成的样品为四方晶系的$CaMoO_4$白钨矿结构,稀土离子La^{3+}、Eu^{3+}、Tb^{3+} 的引入不会改变主晶格的结构。荧光光谱表明,与$CaMoO_4$:Eu^{3+}荧光粉相比,基质中掺杂La 后的$Ca_{0.8}La_{0.15}MoO_4$:0.05Eu^{3+} 样品的616 nm ($^5D_0\rightarrow{}^7F_2$) 处的特征发射峰明显增强。在285 nm紫外光激发下,$Ca_{0.8}La_{0.16-y}MoO_4$:0.04Tb^{3+},yEu^{3+} (y=0.01,0.03,0.05,0.07) 系列样品在545 nm和616 nm 处出现的发射峰,分别对应于Tb^{3+}的$^5D_4\rightarrow{}^7F_5$ 跃迁和Eu^{3+}的$^5D_0\rightarrow{}^7F_2$ 跃迁,并且随着Eu^{3+} 掺杂量的增加,Tb^{3+} 的发射峰逐渐减弱,Eu^{3+}的发射峰逐渐增强,表明该荧光材料中存在着由Tb^{3+} 到Eu^{3+} 能量传递。随着$Ca_{0.8}La_{0.16-y}MoO_4$:0.04Tb^{3+}, yEu^{3+}(y=0.01,0.03,0.05,0.07) 系列样品中激活剂Eu^{3+}掺杂量的增加,荧光粉实现了从绿色→黄绿→黄色→红色的颜色可调。

关键词： $Ca_{0.8}La_{0.2}MoO_4$ 荧光材料 水热合成 多色发光

Hydrothermal Preparation and Multi-color Luminescence Properties of $Ca_{0.8}La_{0.2-x-y}MoO_4$: xTb^{3+}, yEu^{3+}

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Abstract: $Ca_{0.8}La_{0.2-x-y}MoO_4$:$xTb^{3+}$,$yEu^{3+}$ fluorescent materials were prepared by hydrothermal method. The crystal structure and luminescence properties were studied. X-ray diffraction (XRD) patterns confirm that the crystal structure of the samples matches well with the tetragonal $CaMoO_4$. The introduction of rare earth ions La^{3+}, Eu^{3+}, and Tb^{3+} doesn't change the structure of the host lattice. Comparing with $CaMoO_4$:Eu^{3+}phosphors, the characteristic emission peak in 616 nm ($^5D_0\rightarrow{}^7F_2$) of $Ca_{0.8}La_{0.15}MoO_4$:0.05Eu^{3+} is enhanced obviously. The emission spectra of $Ca_{0.8}La_{0.16-y}MoO_4$:0.04Tb^{3+},yEu^{3+}(y=0.01, 0.03, 0.05, 0.07) exhibit two emission peaks at 545 nm and 616 nm under 285 nm UV excitation, corresponding to the transition of $^5D_4\rightarrow{}^7F_5$ of Tb^{3+} and $^5D_0\rightarrow{}^7F_2$ of Eu^{3+}. It is found that the emission intensity of Eu^{3+} increases and the emission intensity of Tb^{3+} decreases with the increasing of Eu^{3+} content, indicating that there is energy transfer of $Tb^{3+}\rightarrow Eu^{3+}$. Moreover, the luminescence colors of the $Ca_{0.8}La_{0.16-y}MoO_4$:0.04Tb^{3+}, yEu^{3+} (y=0.01, 0.03, 0.05, 0.07) samples can be tuned from green, green-yellow and yellow to red by simply adjusting the relative doping concentrations of the activator ion of Eu^{3+} under a single wavelength excitation.

Keywords: $Ca_{0.8}La_{0.2}MoO_4$ luminescent material hydrothermal preparation multi-color emitting

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