



材料合成及性能

Ca₁₀Li(PO₄)₇: Dy³⁺, Ce³⁺材料的制备及发光性能

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摘要: 采用高温固相法制备了Ca₁₀Li(PO₄)₇:Dy³⁺发光材料,研究了Dy³⁺在Ca₁₀Li(PO₄)₇基质中的发光特性。XRD测量结果表明,烧结温度为1 050℃时所制备的样品为纯相Ca₁₀Li(PO₄)₇晶体。从激发谱可以看出样品主激发峰位于349 nm(⁶H_{15/2}→⁶P_{7/2}),363 nm(⁶H_{15/2}→⁶P_{5/2}),385 nm(⁶H_{15/2}→⁶M_{21/2}),样品可被UV-LED管芯有效激发。发射谱由位于481 nm(蓝)和572 nm(黄)的两个峰组成,对应的能级跃迁为⁴F_{9/2}→⁶H_{15/2}、⁶H_{13/2}。研究了不同Dy³⁺掺杂浓度对发光强度的影响,当Dy³⁺的摩尔分数为10%时发光最强。掺入Ce³⁺作为敏化剂,Ce³⁺→Dy³⁺发生共振能量传递,当掺杂量为10%Dy³⁺、14%Ce³⁺时,样品发光最强,其强度为单掺10%Dy³⁺时的13.4倍。发光颜色由黄白变为蓝白。

关键词: Ca₁₀Li(PO₄)₇: Dy³⁺, Ce³⁺ 发光 浓度猝灭 能量传递

Synthesis and Luminescence Properties of A Novel Ca₁₀Li(PO₄)₇: Dy³⁺, Ce³⁺ Phosphor

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Abstract: A novel Ca₁₀Li(PO₄)₇:Dy³⁺ phosphor was prepared by solid state reaction method, and its luminescence properties were studied. XRD results showed that 1 050℃ was a suitable sintered temperature for preparation of Ca₁₀Li(PO₄)₇:Dy³⁺ phosphors. The main excitation peaks were located at 349 nm (⁶H_{15/2}→⁶P_{7/2}), 363 nm (⁶H_{15/2}→⁶P_{5/2}) and 385 nm (⁶H_{15/2}→⁶M_{21/2}). The sample can be excited by UV-LED. The emission spectra composed two peaks, which were located at 481 nm (blue) and 572 nm (yellow), corresponding to the ⁴F_{9/2}→⁶H_{15/2}、⁶H_{13/2} typical transition of Dy³⁺. The influence of doped Dy³⁺ concentration on the luminescent intensity of Ca₁₀Li(PO₄)₇:Dy³⁺ was investigated. The relative intensity of Ca₁₀Li(PO₄)₇:Dy³⁺ sample reached the maximum value when Dy³⁺ mole fraction was 10%. The intensities increased with Ce³⁺ mole fraction. The relative intensity of the sample reached the maximum value when Dy³⁺ mole fraction was 10%, Ce³⁺ mole fraction was 14%. The intensity is 13.4 times higher than the original. The color of the phosphor was changed from yellow-white to blue-white.

Keywords: Ca₁₀Li(PO₄)₇: Dy³⁺, Ce³⁺ luminescence concentration quenching energy transfer

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