

论文

稀土掺杂氟化镁钾纳米晶的合成及其光谱特性

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摘要:

采用微乳液法合成了Eu²⁺, Ce³⁺单掺和双掺KMgF₃纳米晶, 分析了样品的结构与形态. 结果表明, 所合成的样品均为单相, 颗粒粒度分布均匀. 讨论了光谱特性并与高温固相法合成的产物作了对比. 研究发现, 在KMgF₃纳米晶双掺体

系中, 由于Eu²⁺和Ce³⁺竞争吸收激发能, 只能观察到Ce³⁺的发射带; 而在KMgF₃多晶共掺体系中, 因为存在Ce³⁺→Eu²⁺能量传递过程, 只能观察到Eu²⁺的发射峰.

关键词: 微乳液; 稀土离子; KMgF₃纳米晶; 光谱; 能量传递

Synthesis and Spectral Properties of Eu²⁺/Ce³⁺ Doped Potassium Magnesium Fluoride Nanoparticles

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Abstract:

Phosphors of KMgF₃:Eu²⁺, KMgF₃:Ce³⁺ and KMgF₃:Eu²⁺, Ce³⁺ nanoparticles were synthesized in cetyltrimethylammonium bromide(CTAB)/2-octanol/water microemulsion systems. X-ray diffraction (XRD) patterns was used to identify the formation of KMgF₃ phase without detectable impurity. Environment scanning electron microscopy(ESEM) images show the even size distribution of the nanoparticles with pellet morphology. Photoluminescence characteristics of the rare earth ions doped nanoparticles were investigated and compared with that of the polycrystalline products prepared by solid state reaction at a high temperature. The emission band of the Ce³⁺ could only be observed due to absorbing the exciting energy competitively between the Eu²⁺ and Ce³⁺ in co-doped system of KMgF₃ nanoparticles, while the emission peak of the Eu²⁺ could only be observed due to energy transfer from Ce³⁺ to Eu²⁺ appearing in the KMgF₃:Eu²⁺, Ce³⁺ polycrystalline powder. The mechanism on energy transfer from Ce³⁺ to Eu²⁺ in polycrystal and from Eu²⁺ to Ce³⁺ in nanocrystal KMgF₃:Eu²⁺, Ce³⁺ was discussed by means of Eu²⁺ excitation spectrum and Ce³⁺ emission spectrum.

Keywords: Microemulsion; Rare earth ion; KMgF₃ nanoparticles; Spectroscopy; Energy transfer

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