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鱼骨状 $\text{LaVO}_4:\text{Eu}^{3+}$ 纳米晶的水热合成和荧光性能

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摘 要: 在弱碱性溶液中, 采用改进的水热法合成鱼骨状 LaVO_4 和 $\text{LaVO}_4:\text{Eu}^{3+}$ 纳米晶体。用X射线衍射、透射电镜、高分辨透射电镜、紫外-可见光和荧光光谱(PL)研究样品的结构和发光性能, 并探讨溶液pH值、反应时间和反应温度对产品形貌和颗粒大小的影响。结果说明: 前驱体溶液的pH值对产品形貌起关键作用, 而反应时间和温度仅改变产品颗粒的尺寸; 水热反应有助于鱼骨状 $\text{LaVO}_4:\text{Eu}^{3+}$ 晶体从单斜独居石型结构向四方锆石型的转变, 而掺杂 Eu^{3+} 的 LaVO_4 的晶格对称性下降, 而其荧光性却得到加强。

关键字: 鱼骨状 $\text{LaVO}_4:\text{Eu}^{3+}$ 纳米晶; 液相合成; 光致发光; 荧光性能

Hydrothermal synthesis and luminescent properties of fishbone-like Eu^{3+} -doped LaVO_4 nanocrystals

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Abstract: Fishbone-like LaVO_4 and $\text{LaVO}_4:\text{Eu}^{3+}$ nanocrystallines were synthesized in basic media by modified hydrothermal process. The obtained products were characterized by XRD, TEM, HRTEM, UV-Vis and Fluorescence Spectrometry. The effects of pH values of the solution, reaction time and reaction temperature on the morphologies of samples and sizes of nanoparticles were investigated. The results show that pH values of the solution play key roles in the formation of product with fishbone-like morphology, but the changes of the average sizes and crystallinity of samples depend on the varieties of the reaction time and reaction temperature. Hydrothermal method is helpful to fabricate zircon-type

samples from monazite-type $\text{LaVO}_4:\text{Eu}^{3+}$ crystals with fishbone-like morphology. Eu^{3+} ions doping in LaVO_4 nanocrystals can decrease the symmetry of LaVO_4 crystal lattice and lead to better luminescent properties than pure LaVO_4 nanocrystals.

Key words: fishbone-like $\text{LaVO}_4:\text{Eu}^{3+}$ nanocrystals; hydrothermal synthesis; photoluminescence; luminescent properties

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