



### 材料合成及性能

#### 利用核壳结构实现纳米颗粒的多色上转换发光

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摘要：将多色荧光标记技术应用于生物信息检测可实现快速、实时、同步大规模检测目标生物分子的目的，利用上转换纳米粒子作为多色荧光探针可有效地避免生物组织自荧光对检测信号的影响。本文制备了具有核-壳结构的稀土氟化物纳米粒子，并通过在核与壳不同位置共掺杂不同浓度的敏化离子和发光离子来改变发光离子各发射峰之间的相对强度。利用不同颜色和强度的发射光谱实现了纳米粒子的多色上转换发光。利用透射电子显微镜成像、X射线衍射分析、发光光谱等测量手段对多色上转换发光纳米粒子进行了形貌、结构和上转换发光性质的表征。实验结果表明，具有核-壳结构的纳米粒子尺寸小于30 nm，呈球形。在980 nm红外光激发下，纳米粒子呈现从红色到蓝紫色的颜色可变的上转换发光。

关键词：上转换 多色发光 稀土纳米颗粒 核壳结构

### Multicolor Upconversion Luminescence from Core-shell Structured Nanoparticles

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Abstract: Multicolor fluorescence labeling techniques used in biological multiplex detection can achieve fast, real-time, simultaneous information for a large number of target bio-molecules. Using upconversion nanoparticles as multicolor fluorescent probes can effectively decrease the influence of auto-fluorescence from biological molecules on the fluorescence signal from the nanoparticles. In this paper, the core-shell structured upconversion nanoparticles were prepared by a facile solvothermal method using polyvinylpyrrolidone (PVP) as the surfactant. By co-doping sensitizer and activator ions in the cores and/or shells, the relative intensity of the emission peak was changed. The multicolor fluorescence was obtained from different nanoparticles with different color and intensity of the emission spectra. These nanoparticles were spherical and their sizes were about 30 nm. With the excitation of a 980 nm diode laser, those nanoparticles emitted bright upconversion luminescence from red to blue-violet.

Keywords: upconversion multi-color fluorescence rare earth nanoparticles core-shell structures

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