



材料合成及性能

二氧化硅对稀土掺杂二氧化钛薄膜形貌与发光性能的影响

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摘要: 为提高稀土掺杂TiO₂薄膜的上转换效率, 采用溶胶-凝胶法和旋涂镀膜工艺制备了Yb³⁺-Er³⁺共掺杂SiO₂/TiO₂上转换光致发光薄膜, 研究了SiO₂对TiO₂薄膜形貌以及发光性能的影响。利用FE-SEM观察了薄膜的表面形貌, 利用分光光度计测试了薄膜在近红外光区域的透射率的变化, 并用荧光光谱仪测试了薄膜的上转换发光光谱。结果表明: SiO₂的掺杂导致TiO₂颗粒尺寸显著减小, TiO₂薄膜在近红外的透射率也有所下降。在980 nm红外光激发下, SiO₂/TiO₂薄膜在630~670 nm处获得了明显的上转换红光发射, 在516~537 nm和537~570 nm处获得了较弱的上转换绿光发射。由上转换发光强度与激光泵浦功率的关系推知, 绿色和红色上转换发光均为双光子吸收发射过程。

关键词: 溶胶-凝胶 SiO₂/TiO₂ 薄膜 稀土 上转换

Effect of SiO₂ on Morphology and Luminescence Properties of TiO₂ Film Doped with Rare Earth

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Abstract: In order to improve the up-conversion efficiency of Yb³⁺-Er³⁺ co-doped TiO₂ film, SiO₂ was doped into the film which deposited on the glass substrate by sol-gel method and spin-coating technique. The effect of SiO₂ on the film's morphology and optical properties was researched. The morphology, near-infrared transmittance, and photoluminescence (PL) spectra of the film were tested and analyzed. The results show that the particle size of TiO₂ decreases with the introduction of SiO₂, but the property of near-infrared light transmittance decreases nearly keep steady. The film emits red light at 630~670 nm, weak green light at 516~537 nm and 537~570 nm under 980 nm excitation. In additional, the intensity of the up-conversion luminescence tends to be saturated with pump power increasing.

Keywords: sol-gel SiO₂/TiO₂ thin film rare earth up-conversion

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