

Optical properties of Pr³⁺ doped silica gel glasses obtained by sol-gel method.

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Streszczenie

Thermally densified silica glasses doped with Pr³⁺ ions were prepared by sol-gel method. Three procedures of synthesis are described. Absorption, emission and excitation spectra of Pr³⁺ doped silica glasses obtained by sol-gel method are reported. We found on the basis of now presented results and those earlier reported that intensities of the absorption bands of Pr³⁺ change with concentration nonlinearly, especially in the range of ³H₄ → ³P₂; ³P₀ and ¹D₂ transitions. This phenomenon could be caused by clustering, which leads to cooperative interactions. On the basis of the absorption spectra measurement, the energy level diagram was prepared which helps in the explanation of the emission properties of glasses synthesized by different techniques. The luminescence spectra were dependent on excitation wavelength. The spectra excited in high UV range exhibited, except emission in the red range corresponding to the ¹D₂ → ³H₄ transition, a broad band emission with characteristic holes at the envelope corresponding to the ³P₂, (³P₁, ¹I₆) and ³P₀ terms. Nature of this broad band emission is discussed. The observed holes result from reabsorption processes, which are controlled by concentration of active ions. Mechanism of their occurrence remains unknown. No emission from ³P₀ level was observed for some kind of glasses, for another one the emission from ¹D₂ and ³P₀ levels was detected.

Słowa kluczowe

Silica sol-gel, Pr³⁺, Spectroscopy

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