

Optical absorption and emission properties of Pr³⁺ and Er³⁺ in mixed alkali borate glasses

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Abstract

This article presents the optical absorption and emission properties of Pr³⁺ and Er³⁺ in mixed alkali borate glasses of the type 68B₂O₃.xLi₂O.(32-x)Cs₂O (where x= 8, 12, 16, 20 and 24). The variation of Judd-Ofelt intensity parameters (Ω_λ), the peak wavelength of the hypersensitive transitions, radiative transition probabilities (A_{rad}) and peak emission cross-sections (σ_p) with x in the glass matrix has been discussed in detail. The changes in position of hypersensitive transition and intensity parameters with x are correlated to the structural changes in the host matrix. The estimated radiative lifetimes (τ_R) of certain excited states of both Pr³⁺ and Er³⁺ in lithium cesium mixed alkali borate glasses are reported. Branching ratios (β) and integrated absorption cross sections (Σ) for certain important transitions are presented. Peak stimulated emission cross-sections (σ_p) are calculated for the observed emission peaks of Pr³⁺ and Er³⁺ ions in this glass matrix.

Keywords: Rare earths; absorption; emission; lifetime; cross section

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