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Research Article

Fluorescence and Nonradiative Properties of Nd³⁺ in Novel Heavy Metal Contained Fluorophosphate Glass

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Abstract

We demonstrate new series of heavy metal containing fluorophosphate glass system. The fluorescence and nonradiative properties of Nd³⁺ ions are investigated as a function of Nd₂O₃ concentration. The variation of intensity parameters Ω_2 , Ω_4 , and Ω_6 is determined from absorption spectra. The spontaneous probability (A) and branching ratio (β) are determined using intensity parameters. The emission cross sections for the 4F_{3/2}→4I_{13/2} transition, which is calculated by Fuchtbabauer-Ladenburg method, decrease from 6.1×10^{-21} to 3.0×10^{-21} (pm²) and those for the 4F_{3/2}→4I_{11/2} transition decrease from 3.51×10^{-20} to 1.7×10^{-20} as Nd₂O₃ concentration increase up to 3 wt%. The nonradiative relaxation is analyzed in terms of multiphonon relaxation and concentration quenching due to energy transfer among Nd³⁺ ions. Finally, the above results obtained at 1 wt %Nd₂O₃ are compared with some of reported laser host glasses which indicated the potentials for broadband-amplifiers and high-power laser applications.

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