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Influence of acceptor concentration on crystallization behavior and luminescence properties of lead borate glasses co-doped with Dy³⁺ and Tb³⁺ ions

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Abstract

Lead borate glasses doubly doped with $Dy^{3+}-Tb^{3+}$ were investigated using optical spectroscopy: photoluminescence and decay time measurements. The main green emission band due to the ${}^{5}D_{4}\rightarrow{}^{7}F_{5}$ transition of Tb^{3+} was observed under excitation of Dy^{3+} . The energy transfer process from Dy^{3+} to Tb^{3+} occurs through nonradiative processes. The energy transfer efficiencies and transfer probabilities as a function of a square of the total rare earth ions concentration using Förster method were calculated. The nonlinear behavior of the energy transfer probability and the luminescence intensity ratio for a higher concentration of acceptor was studied taking into account the possible processes: concentration quenching and partial crystallization of the lead borate glasses.

Keywords: Spectroscopy; X-Ray methods; Optical properties; Glasses; Energy transfer, Rare Earths

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