Effect of Nd3+ Concentration on the Physical and Absorption Properties of Sodium-Lead-Borate Glasses

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The effect of increasing the rare earth ion concentration on the physical and spectroscopic properties of Nd3+ doped sodium-lead-borate glasses have been studied for the compositions (10-x) Na2O–30PbO–60B2O3– xNd2O3, where x = 1.00, 1.25, 1.50, 1.75 and 2.00 mol %. Optical band gaps, cut-off wavelengths and various spectroscopic parameters (E1, E2, E3, F2, F4, F6 and x4 f) have been determined from the room temperature absorption spectra. Judd-Ofelt theory has been employed to determine the intensity parameters W2, W4 and W6which in turn are used to evaluate radiative transition probability (A), branching ratio (b) and radiative lifetime (tR) for the fluorescent level 4F3=2. The W2 parameter and hence the non-symmetric component of electric field acting on Nd3+ ion is found to be highest for glass with 1.75 mol% of Nd2O3. Because of the poor resolution of hypersensitive transition, the covalency of the Nd-O bond has been characterized by the relative intensity of 4I9=2 !4F7=2, 4S3=2. The highest covalency has been predicted for glass with 2 mol% Nd2O3. The radiative properties are found to improve with an increase in concentration of Nd2O3 for the present study.

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