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## Spectroscopic investigations of neodymium doped barium bismuth fluoroborate glasses

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### Abstract

A new series of neodymium doped barium bismuth fluoroborate glasses with the chemical composition of  $(70-x)\text{H}_3\text{BO}_3 + 5\text{Bi}_2\text{O}_3 + 10\text{BaCO}_3 + 7.5\text{CaF}_2 + 7.5\text{ZnO} + x\text{Nd}_2\text{O}_3$  (where  $x = 0.05, 0.1, 0.25, 0.5, 1, 2$  (in wt %)) have been prepared by the conventional melt quenching method. The powder x-ray diffraction pattern confirms the amorphous nature of the prepared glasses. The Urbach energy reveals the minimum disorderness of the glass samples. Judd-Ofelt intensity parameters ( $\Omega_\lambda = 2, 4$  and  $6$ ) were derived from the absorption spectrum and were used to calculate the emission properties. The near infrared emission spectra recorded with 808 nm laser diode excitation for different concentrations of  $\text{Nd}^{3+}$  ions and the emission for the  ${}^4\text{F}_{3/2} \rightarrow {}^4\text{I}_{11/2}$  transition at 1060 nm found to be high intense. The measured decay curves for  ${}^4\text{F}_{3/2}$  fluorescent level exhibit single exponential nature with shortening of lifetime with increase in concentration. The laser parameters such as stimulated emission cross-section, branching ratios, gain band width and optical gain values are found to be high for BBFB: $\text{Nd}^{3+}$  (0.5 wt %) glass. Hence, the results suggested that the present BBFB: $\text{Nd}^{3+}$  (0.5 wt %) glass could be used as an efficient infrared laser source around 1.06  $\mu\text{m}$  region.

**Keywords:** Amorphous material;  $\text{Nd}^{3+}$ : glasses; Urbach energy; Photoluminescence; Judd-Ofelt parameter; Infrared laser.

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