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Laser action in rare earth doped Borosilicate glasses in visible and NIR Region

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The rare earth doped Borosilicate glasses have been prepared by standard techniques. The prepared glass samples have been characterized by XRD, SEM, EDAX, FTIR and TEM. FTIR gives the information about the borate network which lies in the wavelength region $650 - 1700 \text{ cm}^{-1}$ and further verified by the TEM image. The fluorescence spectra were recorded in visible and NIR region. Laser parameters have been computed with help of absorption and fluorescence spectra. CIE Chromaticity diagram have been given in this paper for measuring the colour of vision that the human eye perceives and verifies the results of fluorescence spectrum. Pr^{3+} ion gives emission in the blue

region and most probable transition for Pr^{3+} doped glasses are $^3\text{P}_0 \rightarrow ^3\text{H}_4$. Three laser transitions are observed for Nd^{3+} ion viz $^4\text{F}_{3/2} \rightarrow ^4\text{I}_{9/2, 11/2, 13/2}$ among which the strongest laser transition is $^4\text{F}_{3/2} \rightarrow ^4\text{I}_{11/2}$. Nd^{3+} ion gives red colour emission and lies in the red region of the chromaticity diagram. Sm^{3+} ion gives orange red emission and lies in the orange red region of Chromaticity diagram. The $^4\text{G}_{5/2} \rightarrow ^6\text{H}_{7/2}$ transition is suitable for reddish – orange laser transition for Sm^{3+} ion. Er^{3+} ion gives green colour emission which is used for photonic applications. The suitable laser transition for Er^{3+} is $^4\text{S}_{3/2} \rightarrow ^4\text{I}_{15/2}$ and this transition is perfect for green lasers.

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