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Spectroscopic properties of tellurite glasses co-doped with Er^{3+} and Yb^{3+} (Article)

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Spectroscopic characterization of Er^{3+}/Yb^{3+} co-doped tellurite glasses $70.8TeO_2$-$5Al_2O_3$-$13K_2O$-(11-x)-BaO-$0.2Er_2O_3$-xYb_2O_3, where x=0, 0.4, 0.8, 1.2 and 2 mol% has been carried out through X-ray diffraction, Raman, absorption and luminescence spectra. The Judd-Ofelt intensity parameters were calculated for 0.2 mol% Er^{3+}-doped glass and are used to evaluate radiative properties such as transition probabilities, branching ratios and radiative lifetime. The emission cross-section of the $^4I_{13/2}\rightarrow{}^4I_{15/2}$ transition has been calculated from the absorption data using McCumber's theory. The emission intensity of both, visible and infrared signals as a function of Yb_2O_3, have been studied under 980 nm and 375 nm laser excitation. The physical mechanisms responsible for both, visible and infrared signals in the tellurite samples have been explained in terms of the energy transfer and excited state absorption process. The FWHM of the $^4I_{13/2}\rightarrow{}^4I_{15/2}$ transition as a function of Yb_2O_3 mol% and distance (δ) between the laser focusing point and the end-face of the glass has been reported. It was observed both, experimentally and numerically, a change in the FWHM with variations of δ less than 8 mm. The latter was attributed to the radiation trapping effect.

Author keywords

Broad band emission; Er^{3+}-Yb^{3+} co-doped tellurite glasses; Radiation trapping effect; Spectroscopic properties