Titanate-germanate glasses doped with rare earth ions for infrared photonics

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The family of low phonon barium gallo-germanate glasses (GBG) [1] has been chosen in this study due to the possibility of substituting GeO_2 by TiO_2, playing the role of network-modifier or network-former, depending on its concentration [2, 3]. The optical results confirmed significantly enhanced the near-IR emission bands located at 1.06 μm (Nd^{3+}: $^4F_{3/2} \rightarrow {}^4I_{11/2}$), 1.53 μm ($Er^{3+}$: $^4I_{13/2} \rightarrow {}^4I_{15/2}$), 1.80 μm ($Tm^{3+}$: $^3F_4 \rightarrow {}^3H_6$) and 2 μm ($Ho^{3+}$: $^5I_7 \rightarrow {}^7I_8$) in the function of TiO_2 in GBG system. Several spectroscopic and laser parameters for rare earth ions were determined. Discussed phenomena are important from scientific and technological points of view, contributing to the development of scientific research in glass science and modern photonics. The studies confirmed that rare earth-doped titanate-germanate glasses offer excellent near-IR luminescence properties and could be successfully applied to laser technology.

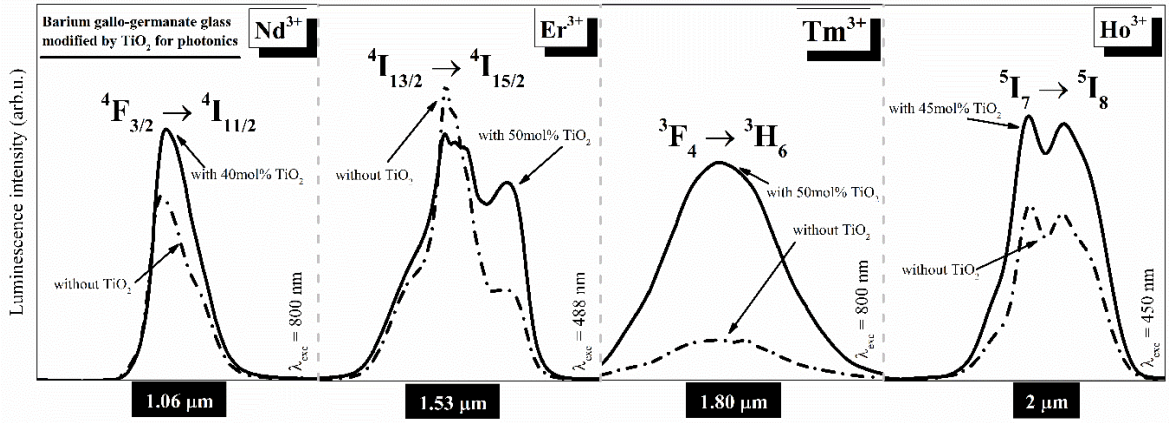

Fig. Near-IR luminescence spectra due to main laser transition of Nd^{3+}, Er^{3+}, Tm^{3+} and Ho^{3+} ions in novel titanate-germanate glasses.

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