Optical spectroscopy of Sm^{3+} doped Na_2O-ZnO-La_2O_3-TeO_2 glasses.

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Streszczenie

Telluride glasses with the composition xSm_2O_3–$(7-x)La_2O_3$–$3Na_2O$–$25ZnO$–$65TeO_2$ (where x = 0.1, 1, 2, 5 and 7 mol%) were obtained by the melt quenching technique. Electronic absorption and fluorescence spectra as well as fluorescence dynamics of the Sm^{3+}-doped title glasses are presented and analysed in detail. A Judd–Ofelt intensity analysis of the absorption spectrum at 300 K has been applied for determination of Ω_λ parameters (Ω_2 = 3.10, Ω_4 = 3.80, Ω_6 = 1.61 × 10^{-20} cm^2) which in turn have been used for calculations of the radiative transition probabilities (A_T), the natural (radiative) lifetimes (τ_R) of the $^4G_{5/2}$ level of Sm^{3+}, the fluorescence branching ratios (β) and the emission cross-sections (σ_{em}). The τ_R value of the $^4G_{5/2}$ level amount to 1546 μs and is slightly higher than the measured decay time of 1306 μs. With the increasing of Sm_2O_3 concentration from 0.1 to 7.0 mol% the experimental lifetime of the fluorescent level decreases from 1306 to 41 μs. An analysis of the non-radiative decay was based on the cross-relaxation mechanisms. The optical achieved results indicate that the investigated glasses are potentially applicable as an orange and/or red laser host.

Słowa kluczowe

sm3+, Telluride glasses, Judd–Ofelt theory, laser materials, optical properties

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