Optical properties, concentration and thermal quenching of luminescence of Dy^{3+}-doped La_2O_3-Na_2O-ZnO-TeO_2 glasses

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Streszczenie

Tellurite glasses of the chemical composition: xDy_2O_3-(7-x)La_2O_3–3Na_2O-25ZnO-65TeO_2, where ($0 < x \leq 7$) were obtained by the melt quenching technique. The spectroscopic characteristic of Dy^{3+}- doped title glasses was carried out based on absorption and luminescence spectra as well as luminescence decay kinetics measurements. The Judd-Ofelt intensity parameters Ω_λ (λ= 2, 4, 6) have been evaluated from the absorption spectrum and subsequently used to calculate the spontaneous emission probabilities, luminescence branching ratios and radiative lifetime of $^4F_{9/2}$ emitting level of Dy^{3+}. The emission cross-sections for Dy^{3+} transitions in the visible range have been determined applying Füchtbauer-Ladenburg formula. The luminescence decay measurements revealed strong concentration quenching of Dy^{3+} emission. The non-exponential decay curves have been fitted in the frame of Inokuti-Hirayma model, indicating that the dipole-dipole interaction plays an important role in luminescence quenching of $^4F_{9/2}$ level. The temperature dependence of luminescence decay times of $^4F_{9/2}$ state of Dy^{3+} has been investigated.

Słowa kluczowe

Tellurite glasses, Luminescence, Judd-Ofelt theory, Thermal quenching, Optical properties, Dysprosium

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