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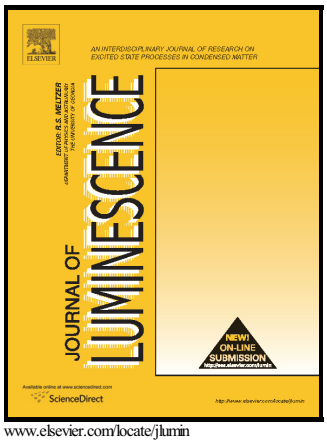

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NIR fluorescence spectroscopic investigations of Er^{3+} - ions doped borate based tellurium calcium zinc niobium oxide glasses

O. Ravi[a], S. J. Dhoble[b], B. Ramesh[d], G. Devarajulu[d] C. Madhukar Reddy[c], K. Linganna[d], G. Rajasekhar Reddy[a] and B. Deva Prasad Raju[d,e*]

[a]*Department of Instrumentation, Sri Venkateswara University, Tirupati - 517 502, India.*
[b]*Department of Physics, RTM Nagpur University, Nagpur-440 033, India.*
[c]*Post Graduate Teacher in Physics, AP Model School, Yerravaripalem,517 194, India.*
[d]*Department of Physics, Sri Venkateswara University, Tirupati - 517 502, India.*
[e]*Department of Future Studies, Sri Venkateswara University, Tirupati - 517 502, India.*

Abstract:

A series of Er^{3+} ions doped tellurium calcium zinc niobium borate glasses were prepared by melt quenching technique. The prepared samples were investigated by optical absorption and near infrared fluorescence spectroscopic studies. The obtained Judd–Ofelt intensity parameters Ω_λ (λ=2, 4 and 6) were determined through experimental and calculated oscillator strengths obtained from absorption spectra and their results are studied and compared with reported literature. The stark-level energies of $^4I_{13/2}$ excited and $^4I_{15/2}$ ground states were evaluated by using both the absorption and emission measurements. The effect of Er^{3+} ion concentration on the emission intensity of $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition was discussed. Intense and broad 1.53 μm infrared fluorescence is observed at 980 nm diode laser excitation. Photoluminescence (PL) and its decay behavior studies were carried out for the transition $^4I_{13/2} \rightarrow {}^4I_{15/2}$ at 1.53 μm emission. The broad emission together with higher values of the bandwidth (81 nm), stimulated emission cross-section (32.25×10^{-22} cm^2) and lifetime (530 μs for 1.0 mol% of Er^{3+}) of level $^4I_{13/2}$ make these glasses attractive for broadband amplifiers. From the analysis of spectroscopic data, the present glass is a prospective photonic material for practical applications in the visible and NIR region.

Keywords: Tellurite glass; Erbium ion; J-O theory; McCumber theory; Gain coefficient.

*Corresponding author: Tel: +91-94402 81769; Email: drdevaprasadraju@gmail.com

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