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Laser excitation studies and crystal-field analysis of ZnO:Tb³⁺ and ZnO:Eu³⁺ powders

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Results from laser excitation studies of Tb³⁺ ions and Eu³⁺ ions in zinc oxide (ZnO) powders are presented; rare-earth doped ZnO (ZnO:RE³⁺) is currently of great interest as a prospective solid-state laser matrix and for optoelectronic device applications. The chemical bath deposition technique was utilized for synthesizing the ZnO:Tb³⁺ and ZnO:Eu³⁺ powders. Photoluminescence spectra of the pelleted samples were obtained in the 460 – 900 nm range. The spectra exhibit sharp emission lines superimposed on a broad emission background with 457.9 nm, 476.5 nm and 488.0 nm argon laser-line excitation. The sharp peaks are attributed to the ⁵D₄ → ⁷F_J (J = 0, 1, 2, 3, 4, 5, 6) and the ⁵D₀ → ⁷F_J (J = 0, 1, 2, 3, 4) electronic transitions of Tb³⁺ and Eu³⁺, respectively. Crystal-field energy levels for the Tb³⁺ ion and the Eu³⁺ ion occupying a C_{3v} symmetry site were deduced.

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MSc

Main supervisor (name and email) and his / her institution

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