

Spectroscopic behavior of Nd³⁺ in a new microcrystalline ZnY₄W₃O₁₆ tungstate.

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In the framework of systematic investigations of the optical properties of a new tungstate ZnY₄W₃O₁₆ in which Y³⁺ cations allow for rare-earth ions doping, the compounds doped with neodymium Nd³⁺ ion were synthesized, analyzed and considered as a possible laser material. The crystalline stoichiometric sample of the chemical formula ZnNd₄W₃O₁₆ and their yttrium diluted analogues 0.5, 1, 5 and 10 mol% Nd³⁺-doped ZnY₄W₃O₁₆ were obtained by a solid-state reaction. X-ray powder diffraction analysis as well as the IR spectra were used to the structural characterization of the compounds. Electron microscopy has been used to analyze the grain size, the presence of aggregates, and the type of boundary between the microcrystals. In order to study spectroscopic properties, the high resolution absorption and emission spectra at room and low temperature were measured in visible and IR regions. The radiative transition probabilities in those tungstates were calculated and analyzed. Based on the 4 K absorption spectra in the range of ⁴I_{9/2} → ²P_{1/2} transition the number of metal sites occupied by the dopants was determined. The strong fluorescent emission involving the ⁴F_{3/2} → ⁴I_{9/2}, ⁴I_{11/2}, ⁴I_{13/2} transitions at 298 and 77 K were observed under pulsed laser and xenon lamp excitation. The dynamics of the Nd³⁺ excited states were characterized by decay times measurements and compared to earlier reported data for neodymium tungstates.

Słowa kluczowe

Nd³⁺ emission, Tungstates, Infrared luminescence, Laser material

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