

Development of Nd³⁺ -doped monoclinic dimolybdates La₂Mo₂O₉ as optical materials.

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Streszczenie

The work presented is mainly focused on synthesis and study of structural and optical properties of microcrystalline Nd³⁺-doped monoclinic dilanthanum dimolybdate at both room and cryogenic temperatures (4K and 77 K). These compounds might be useful for application in the future as optical materials and also as transparent ceramics when the structure is cubic. The Nd³⁺-doped phases with monoclinic structure (α -form, space group P21, unit cell parameters $a = 7:1426$, $b = 7:1544$, $c = 7:1618$ Å and $\beta = 89:538^\circ$) were observed for a concentration of the optically active ions equal to 5%. When the concentration of the Nd³⁺ ions is higher than 15%, a cubic structure is formed (β -form, space group P2₁3, with the lattice parameter $a = 7:155 \pm 0:005$ Å). A series of Nd³⁺-doped La₂Mo₂O₉ phases with different concentration of Nd³⁺ were prepared using conventional solid-state reactions. The formation of phase-pure Nd³⁺-doped La₂Mo₂O₉ has been monitored by powder X-ray diffraction, DSC, SEM, Raman, and FT-IR absorption techniques. High-resolution absorption and emission spectra, as well as the dynamics of the Nd³⁺ excited states characterized by decay time measurements were recorded from room temperature to 4 K. At least two slightly different crystallographic sites are available for the Nd³⁺ ions. First results show that this new Nd³⁺-doped monoclinic La₂Mo₂O₉ molybdate phosphor is promising for applications of ultra-short pulse lasers.

Słowa kluczowe

Nd 3+ emission, Monoclinic System, Molybdates, Near-infrared Luminescence, Powder Lasers

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