Nd^{3+}-activated cubic $BaLaLiWO_6$ and $BaLaNaWO_6$ tungstates: Structure, spectroscopy, and potential for optical ceramic hosts

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Streszczenie

This study explores $BaLaLiWO_6$ (BLLW) and $BaLaNaWO_6$ (BLNW), both cubic perovskite-type tungstates, as potential hosts for optical ceramics. Pure-phase un-doped and Nd^{3+}-doped micro-powders were synthesized *via* solid-state reaction. Their crystal structures, morphologies, and spectroscopic properties were systematically analyzed. Notably, the crystal structure of BLNW was solved from a single crystal for the first time. Substituting Li^+ ion with a larger Na^+ led to lattice expansion and enhanced thermal stability, with BLLW stable up to 1130 °C. SEM analysis revealed microstructures with particle sizes of 0.9–3.9 μm (BLLW) and 1.6–6.2 μm (BLNW). Nd^{3+} ions, introduced as structural probes, enabled assessment of local ordering through low-temperature absorption and luminescence spectroscopy. The findings indicated a greater structural order in BLNW, as evidenced by narrower absorption bands and reduced Stark splitting (104cm^{-1} for BLNW *vs.* 117cm^{-1} for BLLW). A $^4I_{9/2}$ ground-state energy level diagram for the Nd^{3+} ion in both hosts has been proposed.

Słowa kluczowe

Perovskite-type tungstates, Optical materials, Micro-crystalline powders, Nd3+ dopant

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