

Luminescence properties of translucent nano- and micro-crystalline $\text{LuPO}_4\text{:Ce}^{3+}$ films in the 20–700 K range of temperatures.

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Photoluminescent properties of nano- and micro-crystalline $\text{LuPO}_4\text{:Ce}^{3+}$ sintered materials were investigated in the temperature range of 20–700K. It was shown that the nano-powders may be converted into highly translucent layers with good mechanical stability by heat-treatment at 1000°C. Processing at higher temperatures caused grains growth and formation of a network of voids resulting in an increase of light scattering. Luminescent properties were analyzed in the 20–700K range of temperatures. Electron-phonon coupling decreased when grains became smaller. As a result, the Stokes shift was smaller in the nano-ceramics (1010cm⁻¹) than in micro-ceramics (~1580cm⁻¹). Energies of the crystal field components of 2F_{5/2} and 2F_{7/2}, Stokes shift and kinetics of Ce³⁺ luminescence in the nano- and micro-size material over the 20–700K range of temperatures were determined. It was shown that $\text{LuPO}_4\text{:Ce}$ does not suffer from thermal quenching up to about 650K. Nano-ceramics appeared even more resistant to thermal quenching than micro-ceramics showing no indication of decay time shortening up to 700K.

Słowa kluczowe

Translucent ceramics, LuPO_4 , Ce³⁺, photoluminescence, Vibronic structure, Thermal quenching

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