



Spectroscopic investigations of $\text{Cd}_{0.25}\text{Gd}_{0.50}\text{WO}_4:\text{Eu}^{3+}$ — A new promising red phosphor.

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Streszczenie

Novel red-emitting phosphors scheelite-like tungstates of the formula $\text{Cd}_{0.25}\text{Eu}_{0.50}\text{WO}_4$ and $\text{Cd}_{0.25}\text{Gd}_{0.50}\text{WO}_4:\text{Eu}^{3+}$ doped phases with a wide concentration range of the Eu^{3+} ion (0.5, 1, 5, 10 mol%) were prepared. Their photoluminescence properties under ultraviolet–visible (UV) as well as under vacuum-ultraviolet–visible (VUV) excitation were studied in detail. The excitation into the ligand-to-metal charge-transfer (LMCT) states ($\text{O} \rightarrow \text{W}$ at 275 nm and $\text{O} \rightarrow \text{Eu}^{3+}$ at 315 nm) led to blue-green emission.

All samples could be efficiently excited by the UV light (315 as well as 395 nm) resulting in strong red emission. The emission color of prepared phosphor depended on the active ions concentration. The optical properties suggest that $\text{Cd}_{0.25}\text{Gd}_{0.50}\text{WO}_4:\text{Eu}^{3+}$ could be an efficient red-emitting phosphor for white-light-emitting diodes (WLEDs) applications.

The shape of the EPR spectra suggested a local low symmetry environment of Gd^{3+} sites in the investigated samples. Only samples with enough large concentration of Gd^{3+} ions revealed strong antiferromagnetic interactions with the Curie–Weiss temperature parameter, e.g., $\Theta = -25.6$ K (10 mol% Eu^{3+}). A change in the magnetic interaction type with a change in the nominal Eu^{3+} concentration indicates possible limits of the concentration quenching phenomenon observed in the same range of the Eu^{3+} concentration in optical spectra.

Słowa kluczowe

Tungstates, Eu^{3+} , Red-emitting phosphors, WLEDs, EPR spectroscopy

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