

Tailoring the energy storage properties of the $\text{Lu}_2(\text{Ge},\text{Si})\text{O}_5:\text{Pr}$ phosphors varying the Ge:Si ratio.

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Streszczenie

$\text{Lu}_2(\text{Ge}_x\text{Si}_{1-x})\text{O}_5:\text{Pr}$ phosphors were recently reported as very good multimodal luminescence thermometers. However, their luminescence decay traces exhibited profound background at some temperatures, which was detrimental for their thermometric performance. We set out to reveal the possible reasons for such properties. Thermoluminescence glow curves recorded observing either the total emission generated by the Pr^{3+} activator or only one of its three components resulting from the $5d \rightarrow 4f$, $^3\text{P}_0 \rightarrow ^3\text{H}_4$, and $^1\text{D}_2 \rightarrow ^3\text{H}_4$ transitions, allowed us to understand that the phosphors show a very strong capability of excited carriers trapping. These are released while the sample temperature reaches the value when the traps become thermally unstable. Consequently, at some temperature ranges, the luminescence arises both from photoluminescence and persistent luminescence. This is what deteriorates the thermometric properties of the phosphors family. For the luminescence intensity ratio mode or the decay time mode, such properties are evidently unfavorable and should not be neglected in critical analysis of the data.

Adres publiczny

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