

Tracing mechanism of optically and thermally stimulated luminescence in $\text{Lu}_2\text{O}_3:\text{Tb},\text{M}$ (M = Hf, Zr, Ti) ceramic storage phosphors.

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A series of energy storage phosphors, $\text{Lu}_2\text{O}_3:\text{Tb},\text{M}$ (M = Hf, Zr, Ti), were investigated by means of photo- and thermoluminescence techniques to compare the effect of the co-dopant from the same group of periodic table of elements on charge carriers trapping capability and trap parameters. Most of the investigated processes were tracked individually for the Tb^{3+} in the two different metal sites offered by the Lu_2O_3 host – noncentrosymmetric C2 and centrosymmetric C3i. It is proved that both Tb^{3+} ions participate in holetrapping and electrons are immobilized in traps whose depths are defined by the co-dopant. Deepest traps, ~ 1.79 eV, appear upon Ti addition, while Zr and Hf generate traps of very similar, ~ 1.40 – 1.44 eV, depths. The stored energy may be released not only by means of thermal stimulation but also upon the impact of optical photons. Light from the 390–430 nm range of wavelengths was found the most efficient in the latter process. Also deep red radiation of 780 nm releases most of the trapped electrons in Zr/Hf co-doped ceramics but is much less effective in the case of Tb, Ti material. Consistent scheme of electronic levels engaged in charge carriers trapping and subsequent generation of thermo- and optically stimulated luminescence was constructed.

Słowa kluczowe

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