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The bright side of defects: chemistry and physics of persistent and storage phosphors.

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Streszczenie

Ceramic specimens of singly doped Lu_2O_3:Tb, and doubly activated Lu_2O_3:Tb,Ca, Lu_2O_3:Tb,Hf and Lu_2O_3:Pr,Hf were prepared and their thermoluminescent properties were investigated. After irradiation with X-rays or deep-UV photons the singly doped Lu_2O_3:Tb was found to produce a glow curve with a few thermoluminescent bands spread across the temperature range of 50–450 °C. (Tb,Ca) co-doped material produced basically one strong thermoluminescent band peaking at around 120 °C and thus was able to produce persistent luminescence lasting about 10 h, as visible to the human eye. In the (Tb,Hf) co-doped ceramics the thermoluminescence at around 100 °C was seen as a vestige only and was responsible for persistent emission lasting merely a few minutes. Instead, a strong thermoluminescence glow band at around 250 °C appeared. Its intensity faded by about 10% after 6 hours in the dark. Lu_2O_3:Pr,Hf co-doped ceramics also showed intense thermoluminescence with the main components at around 200 °C and 270 °C. The latter was found not to fade in time, while intensity of the former dropped by about 7–8% after 6 h. All these effects were observed in ceramics processed at temperatures as high as 1700 °C. It is proposed that high temperature of processing is necessary as only then clustering of individual defects occurs and the energy released upon heating can diffuse towards the nearby located emitting center efficiently.

Słowa kluczowe

Persistent phosphors, storage phosphors, Lutetium oxide, Trap

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