Thermoluminescent properties of HfO_2:Ti after exposure to X-rays.

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Streszczenie

Radio- and thermoluminescent properties of HfO_2:Ti sintered ceramics were investigated in the temperature range of 10-300K. Fabrication atmosphere altered somewhat the efficiency of radioluminescence but did not affect the spectral distribution of the broad scintillation band covering the 380-570nm range of wavelengths and peaking at 522nm at 10K and about 490nm at 300K. The analogous shift was seen in photoluminescence. Scintillation efficiency was continuously growing from 10K to 300K, while photoluminescence intensity was stable in the 10-250K range of temperatures and was reduced by about 30% at 300K. Analysis of these observations allowed to conclude that diffusion of carriers generated upon the impact of high-energy photons towards the Ti emitting center is strongly temperature-dependent and inferior at lower temperatures. Upon exposure to X-rays at 10K the ceramics stored more than 50% of the absorbed energy. This energy could be recovered later upon thermal stimulation of the ceramics. Four main thermoluminescent peaks were then produced at 95, 140, 243 and 278K. This effect was tentatively associated with theoretically predicted self-trapping of holes in HfO_2. The so-called partial cleaning and T_{max}-T_{stop} experiments indicated that some fraction of traps shows a continuous distribution of their depths.

Słowa kluczowe

Radioluminescence, photoluminescence, thermoluminescence, Hafnia

Adres publiczny

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