

Luminescence of Bi³⁺ and Bi²⁺ ions in novel Bi-doped SrAl₄O₇ phosphor.

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Streszczenie

Bismuth-doped SrAl₄O₇ powders were synthesized via modified Pechini process and their photoluminescence, radioluminescence and thermoluminescence properties were studied and discussed. Obtained results showed that in studied materials bismuth is present in two valence states, Bi³⁺ and Bi²⁺. Upon UV excitation SrAl₄O₇:Bi powders yield broad multicomponent luminescence in the 350–670 nm range, associated with the ³P_{0,1} → ¹S₀ transition of Bi³⁺ ions, and the most intense component located in green (λ_{max} = 515 nm) part of spectrum. It was found that the emission spectral distribution is excitation wavelength-dependent. By changing the excitation wavelength in the 270–340 nm range the emission colour can be modulated from blue, through bluish-cyan to green. The studied phosphors also showed broad-band ²P_{3/2} → ²P_{1/2} Bi²⁺ emission in deep red region centered at around 710 nm. This luminescence was found predominant in radioluminescence and thermoluminescence spectra, which is deemed unique for bismuth-doped materials. The Bi²⁺ 630–830 nm emission might be attractive for bioimaging as it appears in the 1st biological window and may be utilized for deep red scintillation.

Słowa kluczowe

SrAl₄O₇, Bismuth, Luminescence, Radioluminescence, Thermoluminescence, Decay kinetics

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