

Anomalous red and infrared luminescence of Ce³⁺ ions in SrS:Ce sintered ceramics.

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Streszczenie

A blue-green luminescence of SrS:Ce has been known for years. High-density sintered pellets of SrS:Ce were prepared for the first time and their unique spectroscopic properties are reported. A new luminescence band appearing in red and infrared part of spectrum and having all the characteristics of Ce³⁺ emission was obtained after sintering SrS:Ce at 1700 °C. The excitation features of the regular (blue-green) and the new, anomalous emissions are very much different. Together, both excitations spectra cover the whole range of UV and blue part of spectrum. Such characteristics allow for site-selective excitation of both centers. Experiments in the 25–435 K range of temperatures show that the new, anomalous Ce³⁺ emitting center hardly interacts with the regular one. Only excitation around 425 nm leads to superimposed emissions of both centers, especially at higher temperatures. Decay traces show that the regular center decay time is pretty constant between 25 and 435 K (shortens from 25 to 23 ns). However, the anomalous center shows monoexponential decay only at 25 K with time constant of 79 ns, and at room temperature its trace is two-exponential with components of 5 ns (20%) and 50 ns (80%). Aggregation of the dopant ions and its excessive charge compensating defects were postulated to lead to the [Ce³⁺–S^{2–}–Ce³⁺] or [Ce³⁺–V_{Sr}–Ce³⁺] clusters. The spectroscopic data on the anomalous luminescence were also shown to adhere with the possibility of Ce³⁺/Ce⁴⁺ intervalence charge transfer luminescence and semiquantitative scheme for relevant processes was presented.

Adres publiczny

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