

On peculiarities of Eu^{3+} and Eu^{2+} luminescence in Sr_2GeO_4 host.

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Rok wydania

2016

Czasopismo

RSC Advances

Numer woluminu

6

Strony

91836-91845

DOI

10.1039/C6RA18090F

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Powders of $\text{Sr}_2\text{GeO}_4\text{:Eu}$ were prepared in air or forming gas and were investigated for their luminescent properties in the 20–300 K range of temperatures. Oxidizing conditions produced a material with the orange-red luminescence of Eu^{3+} . As many as eight Eu^{3+} symmetry sites active in luminescence were found at low temperatures. Four of them had the expected quite regular characteristics and were assigned to the four Sr sites offered by the host lattice. In addition, another four Eu^{3+} sites producing the $^5\text{D}_0 \rightarrow ^7\text{F}_0$ emission at extraordinarily short wavelengths in the range of 574–577 nm were clearly revealed. Their CT excitation bands peaked at around 325 nm, which is an unusually low energy for the $\text{O}^{2-} \rightarrow \text{Eu}^{3+}$ CT transition. This unusual characteristic of Eu^{3+} luminescence was assigned to the presence of an interstitial oxygen not bound to Ge but strongly interacting with Eu^{3+} ions. The effect was justified using the Wybourne and Downer extension of the Judd–Ofelt theory. Reduced samples did not produce any Eu^{2+} emission at room temperature, but below about 70 K the $5d \rightarrow 4f$ luminescence of the ion came into view with an intense appearance at 20 K. No indications were found of Eu^{2+} luminescence from a few sites. A possible explanation of this observation as well as mechanism of the Eu^{2+} luminescence quenching are discussed.

Adres publiczny

<http://dx.doi.org/10.1039/C6RA18090F>

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