Afterglow luminescence of Lu_2O_3:Eu ceramics synthesized at different atmospheres.

Autorzy

Joanna Trojan-Piegza

Eugeniusz Zych

Rok wydania

2010

Czasopismo

Journal of Physical Chemistry C

Numer woluminu

114

Strony

4215-4220

DOI

10.1021/jp910126r

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Three series of Lu_2O_3:Eu ceramic materials doped with different concentrations of Eu^{3+} ions (0.05−5 atom %) were prepared by sintering at the temperature of 1700 °C of nanocrystalline powders. The heat-treatments were performed in oxidizing, slightly reducing, and strongly reducing atmosphere of air, vacuum, and a N_2−H_2 mixture (9:1 by volume), respectively. The radioluminescent properties of these materials have been systematically studied. After exposure to X-rays, independent of the atmosphere of the preparation, the ceramics exhibited an extensive afterglow, especially long and strong for low Eu concentrations. The afterglow and radioluminescence spectra differed significantly with the former showing much more emission resulting from Eu^{3+} ions occupying the S_6 symmetry site in the host compared to the activator in the C_2 position. The effect was especially significant within the range of low and medium Eu concentrations, 0.05−1 atom %. From the decay traces of the persistent luminescence of Lu_2O_3:Eu ceramics it was concluded that the mechanism of the process is governed by the second order kinetics. It is postulated that only Eu^{3+} ions located within the layer containing both S_6 and C_2 metal ion sites are active in the afterglow emission, while those placed within the layer consisting of only the C_2 metal ion sites do not contribute to the afterglow. Another option is that electronic levels of Eu^{3+} in S_6 site are more favorably positioned to intercept migrating from their traps excited carriers.

Adres publiczny

https://doi.org/10.1021/jp910126r

Strona internetowa wydawcy

https://www.acs.org/content/acs/en.html