

Effect of Na⁺ co-dopant and activator concentration on luminescent properties of CaGa₄O₇: Eu³⁺.

Autorzy

Małgorzata Puchalska

Eugeniusz Zych

Rok wydania

2012

Czasopismo

Journal of Luminescence

Numer woluminu

132

Strony

2879-2884

DOI

10.1016/j.jlumin.2012.06.007

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Two series of calcium gallate phosphors: Ca_{1-x}Eu_xGa₄O₇ and Ca_{1-2x}Eu_xNa_xGa₄O₇ (x=0, 0.002, 0.01, 0.02, 0.03, 0.05) were synthesized by a modified Pechini method and their optical properties at 298 and 77 K were investigated. In undoped CaGa₄O₇ upon 255 nm excitation a bluish white emission (λ_{max} =500 nm) followed by an afterglow of the same color lasting for 10–20 s was observed. Eu³⁺-doping quenched the host-related luminescence and the characteristic red emission of the dopant with maximum at 613 nm appeared. Its excitation spectrum consisted of a broad band assigned to ligand to metal, O²⁻ → Eu³⁺, charge transfer absorption and narrow lines arising from intraconfigurational transitions within the 4f⁶ states of Eu³⁺ ion. The effects of Eu³⁺ concentration and Na⁺ co-doping on the luminescence properties and decay kinetics were studied. Low temperature emission spectra showed that Eu³⁺ ions are positioned in environments of different symmetries. Their relative populations changed with the activator content. Co-doping with Na⁺ ions led to a remarkable reduction of the number of Eu³⁺ sites as well as to noticeable improvement of the luminescence brightness though it did not affect the decay time of the emission. The quantum efficiencies of singly doped CaGa₄O₇:Eu³⁺ were very low (in the range of 1–3.7%). Na⁺ co-doping improved this parameter leading to the highest efficiency of 11% for CaGa₄O₇:3%Eu³⁺,3%Na⁺.

Słowa kluczowe

Calcium gallate, luminescence, quantum efficiency

Adres publiczny

<https://doi.org/10.1016/j.jlumin.2012.06.007>

Strona internetowa wydawcy

<http://www.elsevier.com>

Plik został wygenerowany dnia 2026-10-07 01:54:06

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/k4ZCY9s>.