Uniwersytet Wrocławski

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Plik pochodzi z repozytorium Wydziału Chemii Uniwersytetu Wrocławskiego

Spectroscopic properties of new luminescent system based on vanadate(V) crystal doped with erbium ions.

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Rok wydania

2010

Czasopismo

Journal of Luminescence

Numer woluminu

130

Strony

567-575

DOI

10.1016/j.jlumin.2009.10.032

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Er^{3+}-doped $KCaY(VO_4)_2$ microcrystalline samples were synthesized using a high temperature solid-state reaction technique. Spectroscopic properties of Er^{3+}: $KCaY(VO_4)_2$ are studied and the nature of emissions is discussed. A strong green and infrared luminescence were observed under excitation at 314 nm in the $O^{2-} \rightarrow V^{5+}$ charge-transfer transitions and direct excitation of Er^{3+} ions at 435 nm. A strong emission lines in the blue region are due to the transitions of VO_4^{3-} ions have been observed at 77 K. The Judd–Ofelt parametrization scheme has been applied to the analysis of the room temperature absorption spectra in order to evaluate the intensity parameters, the branching ratios and the radiative lifetimes of the $^4I_{13/2}$, $^4I_{11/2}$, $^4F_{9/2}$ and $^4S_{3/2}$ emitting levels. The effective cross-section has been calculated for the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition, indicating that the title compounds is a promising active medium for application in the three-level laser system. The up-conversion emission in Er^{3+}: $KCaY(VO_4)_2$ was investigated at 300 K. The decay profiles of the Stokes and anti-Stokes emissions were measured and the mechanism of up-conversion luminescence is discussed.

Słowa kluczowe

Vanadates, Erbium, Up-conversion, Excited state, Absorption and emission spectra, Laser parameters

Adres publiczny

https://doi.org/10.1016/j.jlumin.2009.10.032

Strona internetowa wydawcy

http://www.elsevier.com

Plik został wygenerowany dnia 2026-11-15 06:48:33

Adres w repozytorium https://old.chem.uni.wroc.pl/pl/repozytorium/QZDIVNA.