Analysis of the absorption and emission spectra U^{3+} in $CsCdBr_3$ single crystal.

Autorzy

Mirosław Karbowiak

Janusz Drożdżyński

Norman M. Edelstein

Stéphani Schmitt Hubert

Rok wydania

2004

Czasopismo

Journal of Physical Chemistry B

Numer woluminu

108

Strony

160-170

DOI

10.1021/jp036209r

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Laser selective excitation and emission spectra as well as σ- and π-polarized absorption spectra have been recorded for U^{3+} ions diluted in a $CsCdBr_3$ host crystal. Three distinct U^{3+} sites were observed. For the principal site, which was attributed to a symmetric dimer center, 45 crystal-field energy levels in the 0−13250 cm^{-1} energy range were assigned. These experimentally determined levels were fitted to thirteen parameters of a semiempirical Hamiltonian representing the combined atomic, one-electron crystal field as well as two-particle correlation crystal-field (CCF) operators, with an rms deviation of 41 cm^{-1}. Above 14000 cm^{-1} strong electric-dipole allowed $5f^3$–$5f^2 6d^1$ transitions were observed. The lifetime of the $^4G_{7/2}$ fluorescing level has been measured for each of the three U^{3+} sites at liquid-helium temperatures and are 2.5, 4.3, and 7.6 μs. The emission is strongly influenced by temperature due to strong phonon coupling of the $5f^3$ states with the nearby $5f\ ^2 6d^1$ states. Visible upconversion fluorescence observed when pumping the $^4I_{9/2}$ − ($^4F_{7/2}$ + $^4I_{15/2}$) absorption transitions of the principal site *A* is attributed to excited-state absorption (ESA).

Słowa kluczowe

Crystal structure, Crystals, Energy levels, Group theory, Ions

Adres publiczny

https://doi.org/10.1021/jp036209r

Strona internetowa wydawcy

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