

Crystal-field analysis for RE³⁺ ions in laser materials: II. Absorption spectra and energy levels calculations for Nd³⁺ ions doped into SrLaGa₃O₇ and BaLaGa₃O₇ crystals and Tm³⁺ ions in SrGdGa₃O₇.

Autorzy

Mirosław Karbowski

Paweł Gnutek

Czesław Rudowicz

Witold Ryba-Romanowski

Rok wydania

2011

Czasopismo

Chemical Physics

Numer woluminu

387

Strony

69-78

DOI

10.1016/j.chemphys.2011.06.036

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Low temperature polarized absorption spectra are analyzed to achieve assignments of energy levels for Nd³⁺ and Tm³⁺ ions at monoclinic Cs site symmetry in ABC(3)O(7) crystals. Based on the concept of average optical center, the experimental energy levels for single crystals of SrLaGa₃O₇:Nd³⁺ (SLG:Nd), BaLaGa₃O₇:Nd³⁺ (BLG:Nd), and SrGdGa₃O₇:Tm³⁺ (SGG:Tm) were analyzed in terms of the free-ion parameters and the crystal field (CF) ones, B-kq. Assignments of the energy levels resolved in the spectra were done in stages applying the ascent/descent in symmetry method in CF analysis. The actual monoclinic C-s site symmetry at the metal centers in ABC(3)O(7) crystals and the approximated orthorhombic C-2v and tetragonal C-4v symmetry were considered. The starting values of B-kq's for SLG:Nd and BLG:Nd crystals were obtained from superposition model (SPM) analysis. The final fitted crystal field parameters show high compatibility with the existing data for structurally similar ion-host systems. The obtained values of the intrinsic parameters provide basis for SPM analysis of CF parameters for rare earth ions in other similar systems, especially those exhibiting low-symmetry sites. The SPM parameters derived for SLG:Nd are used for simulation and assignment of the energy levels involved in the potential laser transitions at about 1800 nm due to Tm³⁺ ions in SGG crystals. The evaluated emission cross-section is about two times lower than that obtained previously.

Słowa kluczowe

Optical spectroscopy, Crystal (ligand) field parameters, Monoclinic, orthorhombic and tetragonal site symmetry, Nd³⁺ and Tm³⁺ ions, SrLaGa₃O₇:Nd³⁺, BaLaGa₃O₇:Nd³⁺, SrGdGa₃O₇:Tm³⁺

Adres publiczny

[http://dx.doi.org/ 10.1016/j.chemphys.2011.06.036](http://dx.doi.org/10.1016/j.chemphys.2011.06.036)

Strona internetowa wydawcy

<http://www.elsevier.com>

Plik został wygenerowany dnia 2026-10-08 04:29:58

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/-W6NPDS>.