

Analysis of the absorption and luminescence spectra of $\text{U}^{3+}:\text{Cs}_2\text{NaYBr}_6$ single crystals.

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Streszczenie

Uranium(3+) doped $\text{Cs}_2\text{NaYBr}_6$ single crystals with a 2.1 and 0.09 mol% U^{3+} concentration have been obtained by the Bridgman–Stockbarger method. The U^{3+} ions replaced the Y^{3+} ions at an octahedral site of O_h symmetry. Luminescence spectra of the crystal were recorded at 4.2 K. The emission bands observed in the visible and near infrared regions have been assigned to transitions from the lowest components of the and multiplets to the crystal-field components of the ground state. Absorption spectra were recorded in the 3900–35,000 cm^{-1} range at 4.2 K. The analysis of these spectra enabled the assignment of 28 energy levels, which were fitted to seven parameters of an empirical Hamiltonian representing the combined atomic and crystal-field interactions, with a rms deviation of 43 cm^{-1} . The energies of the most prominent vibronic features have been measured and assigned to the specific vibrational modes of the UCl_6^{3-} moiety or to lattice modes. Above 14,000 cm^{-1} vibronic transitions associated with the electric dipole allowed $5f^3-5f^26d^1$ transitions were observed. The unresolved zero-phonon lines are accompanied by a number of vibrational progressions combined with the even $S_1(a_{1g})$ mode.

Adres publiczny

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