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Trends in Hamiltonian parameters determined by systematic analysis of f-d absorption spectra of divalent lanthanides in alkali-halides hosts: II. $CaCl_2:Ln^{2+}$ (Ln = Sm, Eu ,Tm, and Yb).

Autorzy

Mirosław Karbowiak

Czesław Rudowicz

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Systems containing divalent lanthanide elements (Ln2+) are hard to synthesize and thus their characterization isstill largely an unexplored area. The absorption spectra of most divalent Ln2+ions were, until recently, obtainednearly exclusively for Ln2+:CaF2crystals. In thefirst paper in a series devoted to systematic analysis of f-dabsorption spectra of Ln2+in alkali-halides hosts we presented new experimental data for Nd2+and Dy2+ionsin SrCl2and reanalyzed available data for SrCl2:Ln2+(Ln = Sm, Eu, Tm, and Yb). The increased number ofspectral data on the f-d transitions for Ln2+ions makes SrCl2the second best studied matrix. The second paper inthis series is devoted to CaCl2:Ln2+(Ln = Sm, Eu, Tm, and Yb). Thefirst absorption, emission, and excitationspectra for Sm2+,Eu2+and Yb2+in CaCl2are reported. Using a uniform methodology based on a parametricHamiltonian model proposed in Part I, a systematic analysis of the spectra is performed. This approach yieldsrefined and consistent sets of the free-ion parameters and crystal-field (CF) ones. Systematic CF analysis of thelarge spectral dataset for CaCl2:Ln2+consisting of a total of four ions allows revealing inherent trends across theLn series. Our results enable partial verification of the trends uncovered in Part I for Ln2+:SrF2. It appears thatthe trends in the free-ion parameters and, to a lesser extent, CF ones observed for one Ln2+ion are sufficientlysystematic to allow for tentative predictions of the spectrum for any lanthanide ion based on the sets of parameters derived from the spectra obtained for another ion in the same matrix.

Słowa kluczowe

Rare earth alloys and compounds, Optical absorption spectroscopy, Ln 2+ :CaCl 2, Divalent Sm, Eu, Tm, and Yb, Crystal and ligand fields

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