Crystal Field Analysis and Electron-phonon Coupling in Sc_2O_3:Cr^{3+}

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Crystal field analysis of the energy level structure of the Cr^{3+} ion in the Sc_2O_3 crystal is performed, using the exchange charge model of the crystal field theory. The crystal field parameters acting on the optical electrons of the Cr^{3+} ion at the sites with C_2 and C_{3i} symmetry are calculated from the crystal structure data. On the basis of the comparison between experimental absorption and emission spectra and theoretically calculated energy levels of Sc_2O_3:Cr^{3+}, the conclusion is made that the spectroscopic properties of the title host are determined by the Cr^{3+} ion at the positions of C_2 local symmetry. The Stokes shift $S = 4.32$ and the energy of the phonons effectively interacting with an impurity center $\bar{h}\omega = 499$ cm^{-1} are derived from the experimental spectra of absorption and emission.

Key words: Crystal Field Theory; 3*d*-ions; Electron-phonon Coupling.