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# Random strain effects in optical and EPR spectra of electron-nuclear excitations in CaWO4:Ho3+ single crystals

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## Abstract

© the Partner Organisations 2014. We study paramagnetic Ho3+ centers in CaWO4, a promising material for applications in quantum electronics and quantum information devices. Oriented single crystals with nominal holmium concentrations 0.05, 0.5, and 1 at% were investigated at 4.2 K using EPR spectroscopy in the frequency range 37-850 GHz at temperatures 5-40 K and high-resolution optical transmission spectroscopy in the infrared and visible wave-length ranges. Along with the tetragonal Ho3+ centers of the S4 point symmetry, four different types of low-symmetry centers were identified in the EPR spectra and their spectral parameters were determined. A well resolved hyperfine structure exhibiting holmium concentration dependent features was observed in optical spectra. Modeling of the spectra taking into account random lattice strains gave a possibility of reproducing satisfactorily the measured hyperfine structure of the EPR signals, in particular, at anticrossings of the electron-nuclear sublevels of the ground non-Kramers doublet, and the envelopes of the hyperfine structure of optical transitions. The widths of the probability distribution of random deformations related to the point lattice defects in the samples with different concentrations of the impurity Ho3+ ions were estimated from a comparison of the simulated spectra with the experimental data. This journal is

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