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Hyperfine interactions of Ho3 + ions in KY 3F 10: Electron paramagnetic resonance and optical spectroscopy studies

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Abstract

We use high-frequency electron paramagnetic resonance (EPR) and high-resolution optical Fourier spectroscopies to characterize hyperfine interactions of the impurity Ho3 + ions in KY 3F 10 crystals. Well-resolved hyperfine structure is observed in the EPR spectra for several transitions within the ground 5I 8 multiplet of the Ho3 + ion and in the optical spectra for many lines in the infrared and visible ranges. The observed hyperfine patterns and field dependences of the resonance frequencies in the EPR spectra are well reproduced by calculations based on the crystal field (CF) theory. This favors reliability of calculated energies and wave functions of the electron-nuclear states within the ground and excited levels of Ho3 + in KY 3F 10. Finally, the dc magnetic susceptibility of the concentrated KHo 3F 10 crystal taken from literature is successfully modeled in the temperature range 0.01-20 K, using CF parameters of the impurity Ho3 + ions in KY 3F 10. © 2012 American Physical Society.

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