

Theoretical Studies of the Optical Spectra and EPR Parameters of $\text{CaWO}_4\text{: Sm}^{3+}$ Crystal

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The optical spectra and EPR parameters (g factors g_{\parallel} , g_{\perp} and hyperfine structure parameters A_{\parallel} , A_{\perp} of ^{147}Sm and ^{149}Sm) of Sm^{3+} in CaWO_4 crystal are calculated from the second-order perturbation formulas of EPR parameters for a $4f^5$ ion in tetragonal symmetry. In these formulas, the J -mixing among the $^6\text{H}_J$ ($J = 5/2, 7/2$ and $9/2$) states via crystal-field interactions, the mixtures among the states with the same J value via spin-orbit coupling interaction and the interactions between the lowest Kramers doublet Γ_7 and the same irreducible representations in the other 11 Kramers doublets Γ_x via the crystal-field and orbital angular momentum (or hyperfine structure) are considered. The theoretical results agree reasonably with the observed values.

Key words: EPR; Crystal Field Theory; Sm^{3+} ; CaWO_4 .