Investigation of the EPR Parameters of a Trigonal Dy^{3+} Center in $La_2Mg_3(NO_3)_{12} \cdot 24H_2O$ Crystal

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The electron paramagnetic resonance parameters $g_\parallel$ and $g_\perp$ of Dy^{3+}, and the hyperfine structure parameters $A_\parallel$ and $A_\perp$ of $^{161}Dy^{3+}$ and $^{163}Dy^{3+}$ in a $La_2Mg_3(NO_3)_{12} \cdot 24H_2O$ crystal are calculated by the perturbation formulas of the EPR parameters for a $4f^9$ ion in trigonal symmetry. In these formulas, the J-mixing among the ^6H_J ($J = 15/2$, 13/2 and 11/2) states via crystal-field interactions, the mixtures of the states with the same J-value via spin-orbit coupling interaction and the interactions between the lowest Kramers doublet $\Gamma\gamma$ and the same irreducible representations in the other 20 Kramers doublets Γ_X via the crystal-field and orbital angular momentum (or hyperfine structure) are all considered. The crystal-field parameters for the studied Dy^{3+} center are obtained with the superposition model. The calculated results are in good agreement with the observed values.

Key words: Crystal-Field Theory; Electron Paramagnetic Resonance; Dy^{3+}; $La_2Mg_3(NO_3)_{12} \cdot 24H_2O$.