Theoretical Studies on the Gyromagnetic Factors for Nd$^{3+}$ in Scheelites-Type ABO$_4$ Compounds

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The gyromagnetic factors for Nd$^{3+}$ in scheelite-type ABO$_4$ compounds (A = Cd, Ca, Pb, Ba; B = Mo, W) are theoretically studied by the perturbation formulas of the anisotropic $g$ factors $g_{\parallel}$ and $g_{\perp}$ for a 4f$^3$ ion in tetragonal symmetry. In these formulas, the contributions to the $g$ factors due to the second-order perturbation terms and the admixtures of various energy levels are taken into account. The relevant crystal-field parameters are determined by the superposition model and the local geometrical relationship of the A$^{2+}$ sites occupied by the impurity Nd$^{3+}$. The obtained $g$ factors agree reasonably with the observed values. The discrepancies between theory and experiment are discussed.

Key words: EPR; Crystal-fields and Spin Hamiltonian; Nd$^{3+}$; Scheelites-type ABO$_4$ Compounds (A = Cd, Ca, Pb, Ba; B = Mo, W).