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Coherent spin dynamics in a gadolinium-doped CaW O4 crystal

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Abstract

© 2017 American Physical Society. We report the first observation of Rabi oscillations in the spin-7/2 ensemble of trivalent gadolinium ions hosted in CaWO₄ single crystal. A number of transitions within the lowest electronic multiplet 8S_{7/2} of Gd³⁺ ion are studied using a combination of continuous-wave and pulsed electron paramagnetic resonance spectroscopy. The corresponding Rabi damping curves and the spin coherence times are detected at varying strengths of the microwave field. These data are well reproduced by a theoretical model which accounts for the intrinsic inhomogeneity of the microwave field within the microwave resonator and the magnetic dipole interactions in the diluted spin ensemble. The results indicate that the studied 8-level ground manifold of Gd³⁺ ion can represent an effective three-qubit quantum system.

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