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Multifrequency EPR study of Cr³⁺ ions in LiScGeO₄

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Abstract

An electron paramagnetic resonance study of a synthetic single crystal of Cr-doped LiScGeO₄ was carried out at the X- and Q-bands at 300 K and at the broad band (70-370 GHz) at 4.2 K. It was established that the EPR spectra with the magnetic multiplicity $KM = 2$ observed in all the frequency bands are due to the Cr³⁺ substituted for Sc³⁺ at the mirror symmetry octahedral site. The angular dependences of the two symmetry-related spectra of Cr³⁺ in the three crystallographic planes were fitted with the spin Hamiltonian ($S = 3/2$) of monoclinic symmetry. The zero-field splitting of the ground state energy levels was determined as 1.309(5) cm⁻¹ which compares well with that for Cr³⁺ in forsterite and alexandrite crystals with similar olivine-like structure. Additional weak lines due to Mn²⁺ and Fe³⁺ at the mirror symmetry sites were also identified in the X- and Q-band spectra.

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