

Probing the Magnetic Transitions in Europium Chromite through Electron Paramagnetic Resonance

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Received : 27 October 2017

Abstract

We report the synthesis of homogeneous single phase EuCrO_3 nanoparticles by a modified sol-gel followed by hydrothermal methods. Annealing the as-synthesized amorphous powder at 973 K and ambient pressure reveals EuCrO_3 crystallizes into orthorhombic perovskite structure with space group $Pbnm$ and D_{4h}^{19} symmetry. DC magnetic measurements suggest that the Cr^{3+} spins undergo a paramagnetic – antiferromagnetic transition with canting of spins at Cr sublattices with Néel temperature, $T_N = 181\text{K}$, as a consequence of antisymmetric Dzyaloshinsky-Moriya (DM) Cr–O–Cr super exchange interaction. Analysis of temperature-dependent electron paramagnetic resonance spectra reveals that the line-width (ΔH_{pp}), the differential intensity (ΔI_{pp}), the spontaneous magnetization ($4\pi M_s$) and the magnetic anisotropy field (H_k) show an abrupt transition at Néel temperature.

Key words: Sol-gel processing, Nanocrystalline materials, Antiferromagnetics.

PACS: 81.20.Fw, 73.63.Bd, 75.50.Ee