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Magnetoelectric AgCrO2: A new local insight given by PAC

Magnetism, Perturbed Angular Correlation, Magnetoelectric, AgCrO2

Please specify whether you would prefer an oral or poster contribution.

Oral contribution

Summary

Systems exhibiting coupling between ferroelectric (FE) and (anti)ferromagnetic (AFM/FM) orders, are suitable for new magnetoelectric memories, which allow to write electrically information and to read it magnetically (or vice-versa) [1-3].
This work is focused in the delafossite type compound AgCrO2, which has gave rise a recent renewed interest due to its magnetoelectric properties [3]. Single-phase polycrystalline samples were prepared through the standard solid-state reaction method, using O2 flow. The phase purity was checked through Rietveld XRD powder analysis. The temperature dependence of the magnetization and of the dielectric constant exhibits the expected behavior near the AFM and FE ordering temperature (TN =21 K). Furthermore, the temperature dependence of the magnetic susceptibility below T=100 K shows a peculiar behavior, generally attributed to the development of 2D short-range magnetic correlations (SRMC), due to strong frustration, coming from the AFM exchange interactions in a triangular spin lattice [4].
We have studied in detail the temperature dependence of the electric field gradient (EFG) at the Cr site via perturbed angular correlation measurements with the 111In probe. We have evidence that a second EFG emerges below 100 K and remains down to 10 K. In addition, the relative abundance of these two EFG varies linearly extrapolating to 50% at T=0 K.
Taking into account the strong interplay between magnetic and electric degrees of freedom present in AgCrO2, the SRMC can facilitate the onset of a second EFG (EFG2) that having a relatively close frequency to the first one (EFG1), but with a different asymmetry parameter (n2). A possibility that could explain our data is connected with ion polar displacements that would start below 100 K. A-site displacements were in fact suggested to occur in LiCrO2[5]. Moreover, a distortion of the Cr triangular lattice was claimed below TN in CuCrO2 [6]. In this way, our results suggest that the observed EFG2 might be associated with a precursor effect of the FE/AFM phase transition.

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