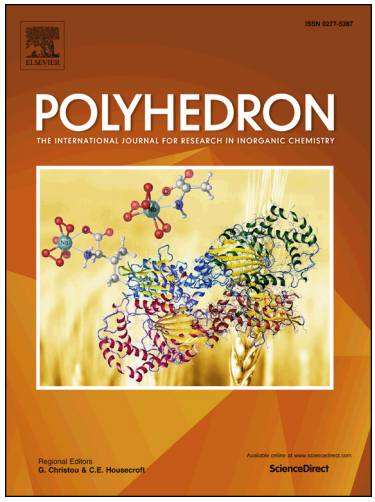

Temperature and the field dependence of the magnetization close to order-disorder phase transitions in dmmn and the chromium-doped DMMn

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TEMPERATURE AND THE FIELD DEPENDENCE OF THE MAGNETIZATION CLOSE TO ORDER-DISORDER PHASE TRANSITIONS IN DMMn AND THE CHROMIUM-DOPED DMMn

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ABSTRACT

We study the temperature and field dependence of the magnetization M(T,H) for the order-disorder transition in DMMn and the chromium-doped DMMn close to T_C. By analyzing the experimental data for M(T,H) from the literature according to the power-law formula, values of the critical exponent (β) and the critical isotherm (δ) are deduced and also, the temperature dependence of magnetization M(T) is calculated from the molecular field theory for those compounds.

Our calculated M(T) and the values of β and δ from the analysis of M(T,H) indicate that DMMn and chromium-doped DMMn undergo nearly second order transition.

KEY WORDS: Magnetization. Order-disorder transition. DMMn, DMMn-Cr1, Cr2, Cr3.

1. INTRODUCTION

Metal organic frameworks (MOFs) have been studied extensively since they show coexistence of electric and magnetic order at the same phase below the transition temperature [1-6]. They are metal formates templated by organic compounds with the general formula (cat) M($HCOO_3$), M=Mg, Zn, Mn, Ni, Co, Fe and cat=ammonium [4, 7], methlyammonium [8], dimethyl ammonium (DMA) [1-3, 5, 6, 8], as also pointed out previously [9].

MOFs of formula $(CH_3)_2NH_2M(HCOO)_3$, M=Mn, Zn, Ni, Co, Fe exhibit electric ordering at 160-185K, associated with ordering of the DMA^+ cations [1-3, 5, 6, 10-12] and they also show magnetic ordering at 8-36K [2, 6, 10, 11]. Among those compounds, DMMn has been extensively studied since it exhibits multiferroic properties, it crystallizes in the perovskite