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Detailed EPR study of spin crossover dendrimeric iron(III) complex

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Abstract

The unusual magnetic behavior of the first dendritic Fe³⁺ complex with general formula [Fe(L)₂]+Cl⁻·nH₂O based on a branched Schiff base has been investigated by electron paramagnetic resonance (EPR) and Mössbauer spectroscopy. EPR displays that complex consists of the three types of magnetically active iron centers: one S = 1/2 low-spin (LS) and two S = 5/2 high-spin (HS) centers with strong low-symmetry and weak distorted octahedral crystal fields. Analysis of the magnetic behavior reflected by I versus T (where I is the EPR lines integrated intensity of the spectrum) demonstrates that the dendritic Fe³⁺ complex has sufficiently different behavior in three temperature intervals. The first (4.2-50 K) interval corresponds to the antiferromagnetic exchange interactions between LS-LS, LS-HS, and HS-HS centers. The appearance of a presumable magnetoelectric effect is registered in the second (50-200 K) temperature interval, whereas a spin transition process between LS and HS centers occurs in the third (200-330 K) one. The coexistence of the magnetic ordering, presumable magnetoelectric effect, and spin crossover in one and the same material has been detected for the first time. The Mössbauer spectroscopy data completely confirm the EPR results. © 2013 American Chemical Society.

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