Magnetostructural Properties of Two Novel Tetranuclear Nickel(II) Complexes

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Introduction

Polynuclear 3d transition metal complexes containing unpaired electrons are of current interest for the design of new magnetic materials for investigating multiple magnetic phenomena [1, 2]. Structural correlations have been well established in complexes where the spins are arranged in a triangular or tetrahedral geometry, but there are few reports of spin frustrated systems for complexes with a rhombic, tetranuclear topology [3, 4]. We have thus characterized two tetranuclear nickel(II) complexes by using different amine molecules [3-(dimethylamino) propylamine for **L13** and 2-(diethylamino) ethylamine for **L14**], which would allow us to better understand the spin frustration that arises from metal spin-states of this symmetry.

Experimental

Variable temperature susceptibility measurements on powder samples of **L13** and **L14** were carried out on a Quantum Design MPMS XL magnetometer from 2 to 300 K with an applied field of 1,000 G. High frequency CW EPR experiments were carried out using the EMR Facility at NHMFL.

Results, Discussion and Conclusions

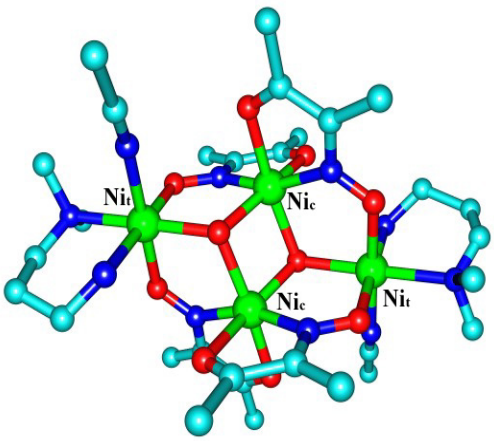

Figure 1: Crystal Structure of L13

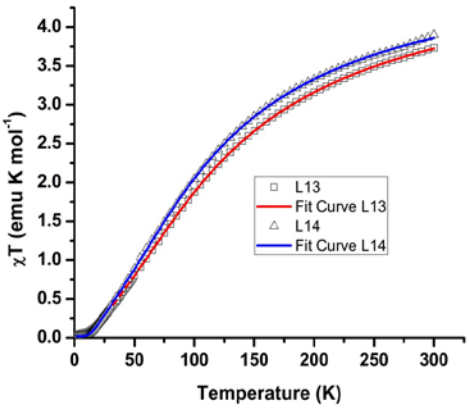

Figure 2: Magnetic Coupling Scheme for L13 and L14

After analysis via the Kambe coupling scheme, MPMS measurements revealed strong antiferromagnetic coupling between terminal Ni atoms, with concomitant ferromagnetic coupling between central and terminal Ni atoms, which agrees quite well with literature structural correlations. No EPR spectrum was observed possibly because of the large antiferromagnetic coupling, which implies a large energy gap between the diamagnetic ground state and first excited paramagnetic state; fast relaxation times prevent the observation of a magnetic resonance peak.

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