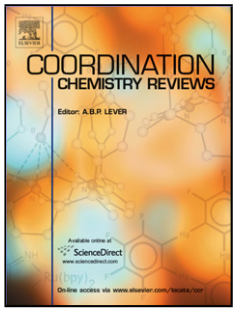

Title: Magnetic properties of transition metal (Mn(II), Mn(III), Fe(II), Fe(III), Ni(II), Cu(II)) and lanthanide (Gd(III), Dy(III)) clusters and [nxn] grids; isotropic exchange and SMM behavior

Author: Laurence K. Thompson Louise N. Dawe

PII: S0010-8545(14)00235-5
DOI: http://dx.doi.org/doi:10.1016/j.ccr.2014.09.004
Reference: CCR 111920

To appear in: *Coordination Chemistry Reviews*

Received date: 6-5-2014
Revised date: 9-9-2014
Accepted date: 10-9-2014

Please cite this article as: L.K. Thompson, L.N. Dawe, Magnetic properties of transition metal (Mn(II), Mn(III), Fe(II), Fe(III), Ni(II), Cu(II)) and lanthanide (Gd(III), Dy(III)) clusters and [nxn] grids; isotropic exchange and SMM behavior, *Coordination Chemistry Reviews* (2014), http://dx.doi.org/10.1016/j.ccr.2014.09.004

Magnetic properties of transition metal (Mn(II), Mn(III), Fe(II), Fe(III), Ni(II), Cu(II)) and lanthanide (Gd(III), Dy(III)) clusters and [nxn] grids; isotropic exchange and SMM behavior.

Laurence K. Thompson,[a]* Louise N. Dawe[b]

[a] Department of Chemistry, Memorial University, St. John's, NL, A1B 3X7

[b] Department of Chemistry, Wilfrid Laurier University, Waterloo, ON, N2L 3C5

Abstract

Polyfunctional hydrazone ligands have provided a wealth of examples of polynuclear grids and clusters based on self-assembly strategies, where simple design elements built into the ligand backbones provide the coordination instructions. The combination of hydrazone oxygen, diazine and terminating N donor functional groups creates coordination options for metals ions which generally, as a result of coordinative unsaturation, do not allow for the ligand to chelate to a single metal ion. Instead the metal achieves coordination completion by aggregation processes where clusters form from multiple combinations of ligands and metal ions, using μ_2-$O_{hydrazone}$, and μ_2-N_2 diazine groups as potential bridges. Examples of transition metal and lanthanide clusters in the range M_3, M_4, M_6, M_9, M_{12}, and M_{16} will be discussed, with magnetic properties interpreted using fully isotropic models in some cases, and approximations where spin state calculations exceed the computer's capacity to handle the enormous matrices involved. In the case of some Dy_n complexes SMM (single molecule magnet) behavior is observed, with relaxation properties interpreted using field and temperature dependent AC measurements.