Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Tunnel-diode Resonator Spectroscopy of Quantum Levels in $Cr_{12}Ln_4$ (Ln=Y,Eu,Gd,Tb,Dy,Ho,Yb) Magnetic Molecules STEVEN YENINAS, MARSHALL LUBAN, RUSLAN PROZOROV, Ames Laboratory, Ames, IA, 50011, WILLIAM A. CONIGLIO, CHARLES C. AGOSTA, Dept. of Physics, Clark University, Worcester, MA 01610, LARRY ENGELHARDT, Dept. of Physics and Astronomy, Francis Marion University, Florence, SC 29501, GRIGORE A. TIMCO, RICHARD E.P. WINNPENNY, School of Chemistry, University of Manchester, Manchester, UK — The differential magnetic susceptibility for a series of $Cr_{12}Ln_4$ (Ln=Y,Eu,Gd,Tb,Dy,Ho,Yb) magnetic molecules was measured in static (up to 16 T) and pulsed (up to 45 T) magnetic fields using a rf tunnel-diode resonator (TDR). At low temperatures, the behavior of these finite spin systems is governed by discrete energy spectra of the individual molecules. In magnetic field, low-energy quantum levels Zeeman-split, crossing at field values where magnetization exhibits a step corresponding to switching between different spin states. In high fields, we detect multiple level crossings which allow for a detailed mapping of the energy diagram. We then perform quantum Monte Carlo (QMC) using a Heisenberg Hamiltonian with three adjustable exchange constants whose values are chosen so as to optimize agreement with the experimental energy spectrum. The variations in results for the studied molecules are correlated to the magnetic properties of the lanthanide ions.

Steven Yeninas
Ames Laboratory, Ames, IA, 50011

Date submitted: 08 Nov 2010 Electronic form version 1.4