Magnetic Compensation in Ferrimagnetic Bimetallic Oxalates

PETER REIS, University of North Dakota and Oak Ridge National Laboratory, RANDY FISHMAN, FERNANDO REBOREDO, Oak Ridge National Laboratory, JUANA MORENO, University of North Dakota — Bimetallic oxalates are layered organic magnets with the chemical formula $A[M(II)M'(III)(\text{ox})_3]$, where $M(II)$ and $M'(III)$ are transition metal ions, $A$ is an organic cation, and $\text{ox} = C_2O_4$ is the oxalate molecule. For some ferrimagnetic bimetallic oxalates, the magnetization changes sign at a compensation temperature below the ferrimagnetic transition temperature. We have initiated a systematic study of these compounds by examining the possibility of magnetic compensation for any possible combination of transition metal ions. Our model includes spin-orbit coupling for both $M(II)$ and $M(III)$ ions, the antiferromagnetic exchange between neighboring metal ions mediated by the oxalate bridges, and the effects of the ligand fields. Using mean-field theory, we predict candidates that may exhibit magnetic compensation for certain choices of the intercalated cation $A$.

1Research sponsored by the Division of Materials Sciences and Engineering, U.S. Department of Energy under contract with UT-Battelle, LLC.

Peter Reis
University of North Dakota and Oak Ridge National Laboratory

Date submitted: 20 Nov 2007