Neutrons Provide Insights into Magnetic Structures of New Frustrated Compounds

Scientific Achievement

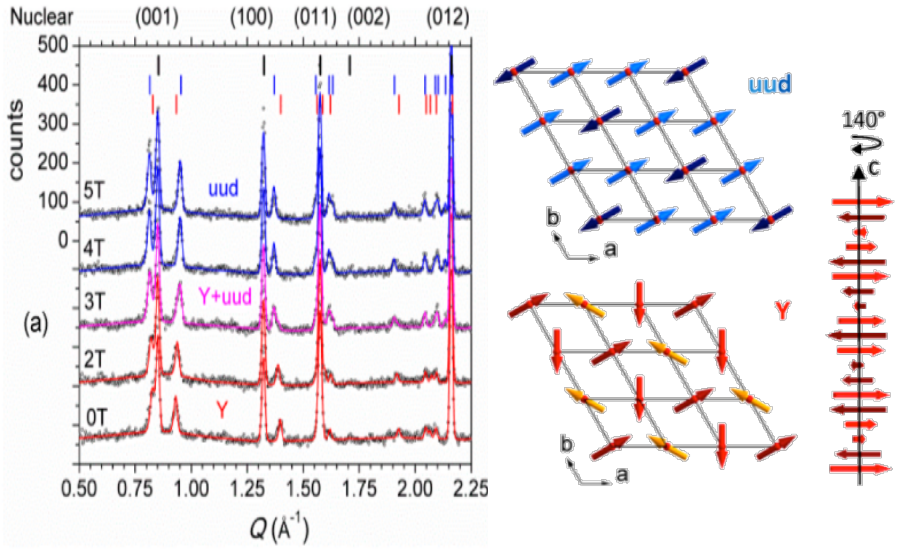
Neutron diffraction studies under applied fields were used to reveal the complex magnetic phase diagram of two new members of the frustrated triangular lattice type with XY-anisotropy.

Significance and Impact

This work introduces a new chemical approach to stabilize frustrated triangular lattices by chemical tuning of the magnetic exchange via complex linkers. Important insights are gained into the rare occurrence of a chiral and helical magnetic ground state (Y-phase) and the transition into the uud-phase upon applied fields. Such materials are in the focus of studies on multiferroics with induced ferroaxial polarization by chirality.

Research Details

The magnetic structures of $AAg_2Fe[VO_4]_2$ with A = K or Rb in applied fields were determined by neutron powder diffraction.



Left: Refined neutron diffraction data for $RbAg_2Fe[VO_4]_2$ in applied fields from 0 – 5T. *Right:* In-plane magnetic structure on the triangular lattice (spin on Fe-atoms). Magnetic order along [001]: Chiral and helical (Y); commensurate (uud).

Work performed at the ORNL High Flux Isotope Reactor's Neutron Source's High Resolution Neutron Powder diffractometer HB2A was supported by Scientific User Facilities Division, Office of Basic Energy Sciences, US Department of Energy. Funding by the National Science Foundation (DMR 1149899) and the Texas Center for Superconductivity is acknowledged.

"Experimental Realization of a Unique Class of Compounds: XY-Antiferromagnetic Triangular Lattices, KAg2Fe[VO4]2andRbAg2Fe[VO4]2, ith Ferroelectric Ground States"
N. E. Amuneke, J. Tapp, C. R. Dela Cruz, A. Möller, *Chem, Mater.* **2014**, dx.doi.org/10.1021/cm502571