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Novel Multiferroic triangular lattice antiferromagnet $RbFe(SO_4)_2$

DIMUTHU OBEYSEKERA, Department of Physics, New Jersey Institute of Technology, Newark, NJ 07102, SABINE NEAL, Department of Chemistry, University of Tennessee, Knoxville, TN 37996, WILLIAM RATCLIFF, NIST Center for Neutron Research, Gaithersburg, MD 20878, JANICE MUSFELDT, Department of Chemistry, University of Tennessee, Knoxville, TN 37996, SIZHAN LIU, TREVOR TYSON, JUNJIE YANG, Department of Physics, New Jersey Institute of Technology, Newark, NJ 07102 — $RbFe(SO_4)_2$ (RFSO) crystallizes in the space group of P-3. The magnetic Fe ions in RFSO form an antiferromagnetic triangular lattice. We have synthesized large high-quality anhydrous crystals of RFSO for the first time utilizing hydrothermal method. We characterized the basic magnetic and ferroelectric properties and utilized single crystal synchrotron X-ray diffraction and neutron diffraction to determine the nuclear structure and magnetic structure of RFSO. Raman measurements were also carried out on the RFSO sample. In this talk, we will discuss the structural and physical properties of the anhydrous magnetic sulfate (RFSO). By summarizing all our experimental results, we have also constructed the phase diagram of RFSO. RFSO is an exciting new candidate for Type-II multiferroic as well as a new type of quantum electromagnet and we will use the results outlined above to discuss how the ferro-rotational order, magnetoelectric coupling and its atomic level structure will give rise unique physics in this material.

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