HIGH MAGNETIC FIELD ANISOTROPIC MAGNETIZATION MEASUREMENTS OF $LuFe_2O_4$

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Introduction

Hexagonal $LuFe_2O_4$ is an antiferromagnet composed of stacked triangular layers with magnetically active Fe^{2+} and Fe^{3+} ions. This compound possesses a significant canted moment that is extremely anisotropic [1]. The isothermal magnetization is highly hysteretic as in a ferromagnet with a large coercive field. In fact, previous studies have been unable to ascertain the coercive field below 70 K. It appears that high magnetic fields may allow one to reach the coercive field at low temperature and perhaps shed light on the origin of this unusually large magnetic anisotropy.

Experimental

The pulsed field extraction magnetometer available at NHMFL-LANL was used in the 60 T pulsed magnet. Measurements were taken at 4.2 K. Single crystals of $LuFe_2O_4$ were grown via the floating zone method and oriented using Laue diffraction. Magnetization versus magnetic field was measured for the two principal crystallographic directions.

Results and Discussion

The magnetization for each direction is shown in Fig. 1. As expected, the coercive field is very large, at more than 15 T along the *c* axis. Previous measurements indicate that the *ab* plane should have a larger coercive field at low *T*, however, this does not seem to be the case. We strongly suspect the crystal was misaligned either during a calibration field pulse, or upon cooling down. In order to properly study this behavior, a larger crystal that can be more easily mounted and aligned into the magnetometer will be used in future experiments.

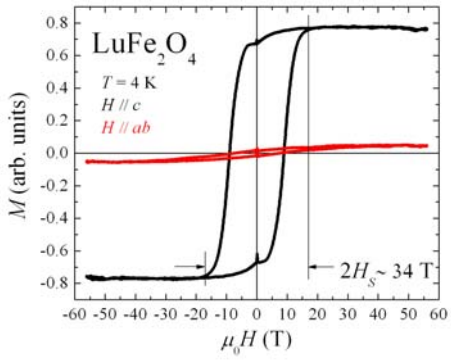

Fig.1, High-Field Magnetization of triangular antiferromagnet $LuFe_2O_4$.

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References

[1] Iida, J. *et al*., J. Phys. Soc. Japan, **62**, 1723 (1993).