MAGNETIZATION OF $\text{LiCu}_2\text{O}_2$ UNDER HIGH MAGNETIC FIELDS

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Introduction

Since the renaissance of multiferroics, non-collinear spiral magnets have drawn much attention with possible multiferroicity via spin-current model [1]. LiCu$_2$O$_2$ is another material which exhibits spiral magnetic order investigated by neutron scattering experiments [2]. But due to the $S=1/2$ spins of Cu$^{2+}$ and its quasi-one-dimensional character, quantum fluctuations are expected as well as classical spin order. In this sense, LiCu$_2$O$_2$ may be the unique multiferroic material which exhibits unusual quantum spin effects.

Before investigating the multiferroic behavior in this compound, we have performed the magnetization experiment up to 30 T to understand the spin structure of LiCu$_2$O$_2$ at high magnetic field.

Experimental

The magnetization was measured with a compensated coil susceptometer adapted to use in pulse magnetic-fields up to 50 T. The short pulse magnet (cell 4) at LANL-NHMFL was used. Magnetic field is applied along the $a$ and $c$-axis of the crystal.

Results and Discussion

Fig. 1 summarizes magnetization measurements as a function of magnetic field at low temperatures. Along the $a$-axis, the magnetization is linear up to ~17 T. But the signal becomes noisy above 17 T. When the magnetic field is applied along the $c$-direction, signal is linear up to ~10 T, but noisy at higher fields.

Conclusions

The problem of resolution can be circumvented by either increasing the size of the sample or using a different magnetometer with better resolution. The multiferroic properties of LiCu$_2$O$_2$ is planned to be measured under magnetic fields by dielectric constant and polarization measurement by the short pulse magnet.

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References