**High Field Magnetostriction of USb Single Crystals**

Gofryk, K., Shrestha, K. (Idaho National Laboratory); Jaime, M., Weickert, F. and Harrison, N. (NHMFL)

**Introduction**

Our recent discoveries in UO2 [1] motivated us to perform extensive high field magnetostriction measurements on the sister compound uranium antimonide USb. It crystallizes in the cubic NaCl-type crystal structure, and is known to order antiferromagnetically) below TN = 213 K in a so-called triple-k magnetic structure with wave vector (1,0,0) [2, 3]. Here we performed detailed magnetostriction measurements of high quality single crystals of USb at pulsed magnetic fields up to 65 T. The results of the magnetostriction measurements performed in a wide temperature range will help to better understand the spin-lattice coupling in this material. The results of the studies on USb will be compared to uranium dioxide in terms of its piezomagnetic properties.

**Experimental**

A high quality single crystal of uranium antimonide of the size of ~1 x 1 x 1 mm3 is used. Dependencies of the sample length L as a function of the temperature and magnetic field ΔL/L = [L(H, T) − L(H0, T0)]/L(H0, T0) are measured using a fiber Bragg grating (FBG) technique [4], which utilizes reflected light in a 0.5 mm long Bragg grating inscribed in the core of a 125 μm telecom-type optical fiber. The USb sample is glued to the FBG, which transmits changes in the sample dimension L to the fiber when temperature or magnetic field is changed. The experiments have been performed at the National High Magnetic Field facility at LANL in a 65 T Multi shot (25 mS) magnet.

**Results and Discussion**

**Figure 1** shows the field dependencies of the length change of USb obtained inside the paramagnetic state. The measurements have been carried out for the magnetic field applied along <100> and <110> crystallographic directions. As seen can be seen in Fig.1, the magnetostriction is positive for both crystallographic directions and shows a ~ H2 dependence.

**Figure 1** The magnetostriction of USb crystal measured above TN =123 K with magnetic field applied along <100> and <110> axis.

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**References**

[1] M. Jaime et al., Nature Communications 8, Article number: 99 (2017)

[2] J Rossat-Mignod, et al. Physica B, 102 (1980), p. 237

[3] K. Knöpfle and L. M. Sandratskii, Phys. Rev. B 63, 014411 (2000)

[4] Jaime, M. et al. Magnetostriction and magnetic texture to 100.75 Tesla in frustrated SrCu2(BO3)2. *Proc. Natl Acad. Sci. USA* 110, 12404–12407 (2012).