MAGNETOSTRICTION EXPERIMENTS IN $YbInCu_4$ USING A DILATOMETER FOR PULSED FIELDS

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We have developed a plastic dilatometer for pulsed fields at the NHMFL-LANL. It is a very small design (cylindrical shape 5 mm diameter) that fits in a 50T mid-pulse magnet (characteristic decay time around 100 ms). The resolution that we can get is $\Delta L / L < 10^{-4}$.

We have tested the device measuring $YbInCu_4$ single crystals. $YbInCu_4$ is a system with cubic crystal symmetry that undergoes a isostructural first order phase transition at $T_V = 41$ K. In the high temperature phase the Yb ion is nearly trivalent, while in the low temperature phase it has a mixed valence. [1] At T_V an abrupt lattice expansion ($\Delta L / L \sim 15 \cdot 10^{-3}$) takes place. [2]

Figure 1 shows a typical magnetostriction experiment at 25 K during the up-sweep part of the pulse.

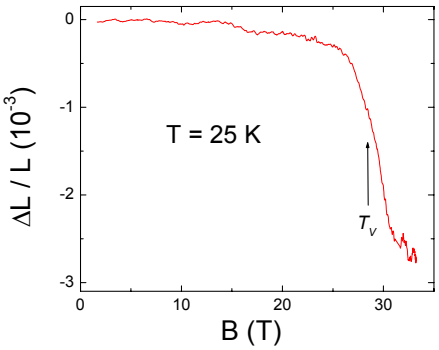

Figure 1 – Linear magnetostriction showing the first order phase transition.

The same experiments were done for the whole temperature range giving rise to the B vs. T phase diagram shown in Figure 2. A fit to previously reported resistivity data [3] is also shown for comparison. The deviation at high temperature is a thermal link problem. The device is being currently replaced by a sapphire one to achieve better thermal conductivity.

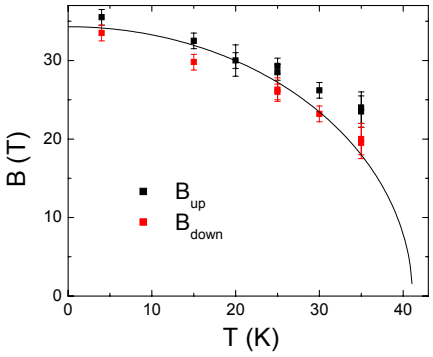

Figure 2 – Magnetic field vs. temperature phase diagram.

References

[1] Felner, I. and Nowik, I., Phys. Rev. B, **33**, 617 (1986).
[2] Felner, I., *et al*., Phys. Rev. B, **35**, 6956 (1987).
[3] Immer, C.D., et al., Phys. Rev. B, **56**, 71 (1997).