Magnetoelastic Correlations in the $URu_{2-x}Fe_xSi_2$ System: Magnetostriction Measurements in Pulsed Magnetic Fields.

Breindel, A.J., Pouse, N., and Maple, M.B. (UC San Diego, Physics), Jaime, M. (NHMFL, LANL)

Introduction

The compound URu_2Si_2 is of great interest due to its "hidden order" phase. This phase was identified by an anomaly in the specific heat and a large drop in the associated entropy [1]. After over 3 decades of study, the origin and nature of this transition have not been definitively determined. Our lab discovered that the substitution of Fe for Ru is a strong analogue for the application of pressure, including an enhancement of the hidden order phase [2]. This allows the study of pressure effects on URu_2Si_2 using probes that would be difficult to employ under applied pressure. One such probe is magnetostriction, the change in sample dimensions in response to an applied magnetic field.

Experimental

We prepared samples of $URu_{2-x}Fe_xSi_2$ which we studied using a Fiber Bragg Grating dilatometry probe [3] to study the magnetostriction of the samples in high magnetic fields of up to 62 T using the pulsed magnets at Los Alamos National Laboratory NHMFL.

Results and Discussion

Fig. 1 shows an example of the magnetostriction results obtained from our research. We believe our results indicate the formation of a metamagnetic transition within our samples and will allow us to complete a three-dimensional phase diagram of $URu_{2-x}Fe_xSi_2$ using the magnetostriction probe. This will be compared with earlier research on $URu_{2-x}Fe_xSi_2$ which also produced a three-dimensional phase diagram of the compound [4]. We believe our results expand on this earlier research and possibly indicate new phases in the compound that were not seen in the earlier research, which used resistivity to probe the material.

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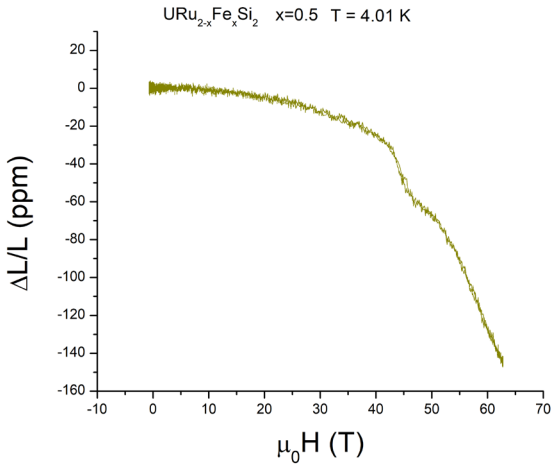

Fig.1 Magnetostriction for $URu_{2-x}Fe_xSi_2$ at x = 0.5 up to 62 T at 4 K.