Contact-free Investigation of ReBCO Coated Conductors by Vibrating Sample Magnetometer

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Introduction

A piezoelectric vibrating sample magnetometer (VSM) was developed, as seen in **Figure 1**, to investigate the transport properties of (Re)$Ba_2Cu_3O_{7-x}$ coated conductors (where Re stands for the rare earth element).

Figure 1. Schematic of VSM probe designed for experiments.

The ease of use of the coil set and design of the probe still needs some optimization, though a successful test was made and an irreversible hysteresis response was seen in high magnetic fields associated with a superconductor. Calibration of the voltage response to the absolute magnetic moment is still ongoing.

Experimental

The VSM probe was mounted with a 4 mm by 3 mm superconducting coated conductor and studied in the 32.1 T resistive magnetic at the NHMFL DC facility. Voltage induced in the VSM coils was measured at constant sweeping field rates as well as at constant magnetic field.

Results and Discussion

The voltage response induced in our pickup coils can be seen in **Figure 2**. It is indicative of the hysteresis induced by a superconductor in a magnetic field with a fairly large paramagnetic signal associated with the sample substrate. This response was observed at near liquid He temperatures and liquid N temperatures. A response indicative of a paramagnetic response was observed at room temperature.

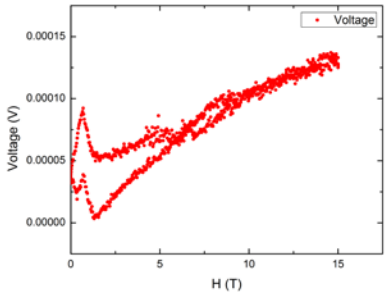

Figure 2. The voltage response from our VSM at near liquid He temperature.

Conclusions

A VSM was developed to study the magnetic properties of coated conductors at NHMFL. Coils were wound in house and a response indicative of a superconductor was observed. Results are still preliminary and the instrument still needs calibration.

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