PES IN AuZn TO OBSERVE PHASE TRANSITIONS AS A FUNCTION OF MAGNETIC FIELD

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Introduction

The pulsed ultra sound (PUS) system was applied to measure sound speed in a AuZn. Sample. The purpose was to demonstrate the capability of the PUS system for measuring realistic materials in a pulse magnetic field environment.

Experimental

A bar of polycrystal AuZn was shaped into a geometry for launching and detecting ultrasound echoes in the sample. The sample was a 1x2x4 mm cuboid with the smallest faces polished parallel to each other. Transducer mounting was a trial and error procedure and the best result was from using a small amount of crystal bond on the sample face and then pressing the transducer onto the face. Wires to power the transducer were 10 micron platinum wires attached to the coaxial lead and the sample by silver epoxy. This was quite delicate work but can be reproduced. The transducer was a fragment of a commercial piezoelectric product with a resonant frequency around 30 Mhz. The transducer was polished on the sides so that it was of the same dimension as the small sample face.

Results and Discussion

With this setup we demonstrated that rf pulses as short as 200 nanoseconds would give strong echo returns with good separation between subsequent echoes. The pulse repetition rate could be as high as 20 kHz.

We ran a cool down curve on the sample tracking sound speed and discovered that this particular material was a very bad candidate for quantitative sound speed measurements. The material was very hysteretic and a simple sound speed versus temperature was not possible. But we were able to demonstrate that the technique can be applied to small samples and that relative sound velocity changes can be measured to 1 part in 50,000 by viewing a single echo return. Also the transducer worked at cryogenic temperatures and did not separate from the sample.