Abstract Submitted
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Experiments in NMR Force Microscopy[1] ISAAC MANZANERA, University of Texas at Austin. Department of Physics, ROSA CARDENAS, Sandia National Laboratories at Livermor, JEREMY PASTER, AMANDA TURBYFILL, JOHN MARKERT, University of Texas at Austin. Department of Physics — We report details of the construction and use of three nuclear magnetic resonance force microscopy (NMRFM) probes, as well as the development of control systems for three-dimensional nanoscale imaging and spectroscopy. Our variable temperature probe performed position-dependent ^{1}H NMR force measurements on a 25x15x7 μm^3 single crystal of ammonium sulfate $(NH_4)_2SO_4$ at room temperature in a sample-on-oscillator geometry. Force signals were detected with a signal-to-noise ratio of 6, and 12 μm resolution, in a one-dimensional scan. Measurements of NMR relaxation times T_2^*=1.5$\pm$0.2 μs, T_2= 44$\pm$2 μs, and T_1=5.6$\pm$0.7 s were obtained. We describe the upgrade of our ^{3}He NMRFM probe for measurements towards the base temperature of 0.3K for investigation of nanoscale structures and metal oxide interfaces using the iOSCAR technique and perpendicular-cantilever geometry. Force-detected ^{11}B NMR signals in a 30 μm crystal of superconductor MgB_2 have also been achieved using this probe. Efforts in the development of our NMRFM probe for the study of biological samples in liquid media are reported. Magnetic field effects on micromagnet films on cantilevers are being studied for the characterization of the mechanical sensors to be used in these liquid experiments.

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