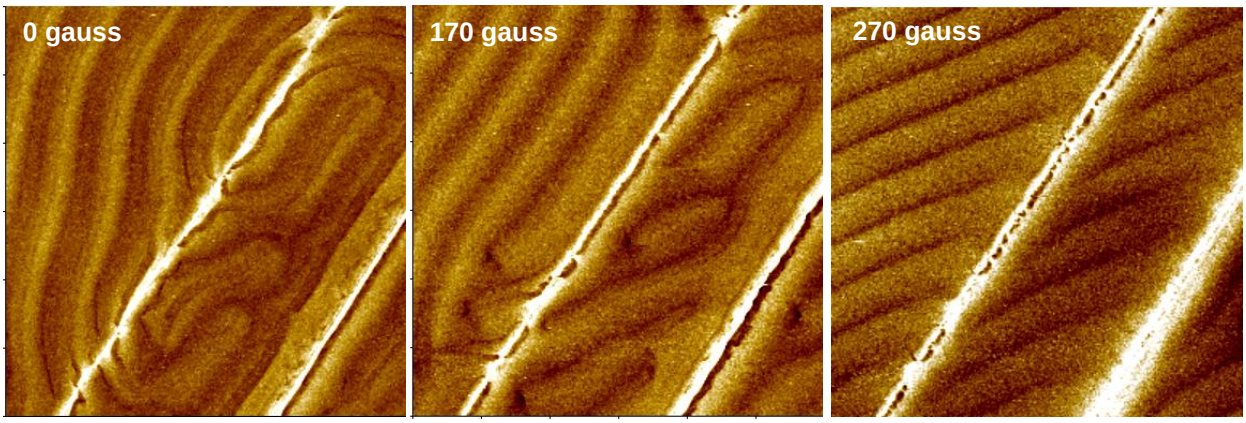
Single Crystal Yttrium Iron Garnet (YIG) Magnetic Properties - (Tunable Magnetic Field MFM)

Sample:
Single **crystal Yttrium iron garnet (YIG).**

Image Conditions:
MFM
TM-MFM
Scan size (30um)
Scan rate (0.5Hz)
Z servo gain (1.2)
Pixel (512 x 512)

System Requirement:

MFM
Tunable Magnetic Field
Tunable Magnetic Field can apply a magnetic field up to 300 gauss with field resolution of 3 gauss



Tunable Magnetic Field MFM (TM-MFM) can be used for high resolution magnetic domain studies under the tunable condition of the magnetic field. The observation of magnetic wall domains can be studied at 50 nm resolution. The images shown above are MFM images of Yttrium iron garnet (YIG) under different magnetic fields. The magnetic domain change had been observed under different magnetic field. YIG is a ferrimagnetic material with chemical composition Y3Fe2(FeO4)3, or Y3Fe5O12. In YIG, the iron ions occupy two octahedral and three tetrahedral sites and the iron ions in the two coordination sites exhibit different spins, resulting in magnetic behavior. Interesting magnetic properties can be obtained by substituting specific sites with rare earth elements. A negative refractive-index metamaterial which responds to magnetic fields can be fabricated by using YIG.

Publication using Tunable Magnetic Field MFM

Journal: IEEE Transaction on Magnetics, 42(10) October 2006. 3249.
Title: Effect of Magnetic Field on the Magnetic Domain
Authors: J. B. Kim, Y. P. Lee, K. S. Ryu, S. C. Shin, H. Akinaga, and K. W. Kim;
System: Park Systems XE-100

Abstract: We have observed the magnetic domain evolution under an external magnetic field in an epitaxial MnAs film on GaAs(001) by magnetic force microscopy. Owing to the strain involved, the ferromagnetic –MnAs and the paramagnetic –MnAs phases coexist as self-aligned stripes at room temperature. It was found that a complex magnetic domain structure appeared in the ferromagnetic -phase region at the demagnetized state (= 0Oe). As the magnetic field increased, the magnetic domain structure was gradually changed, and reached a completely saturated state at = 600 Oe. (more)

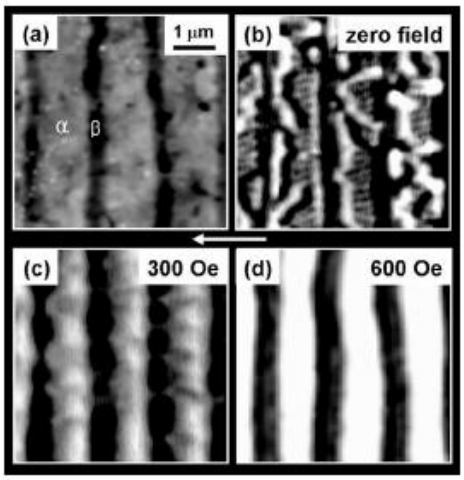


Fig. 2. (a) AFM and (b)–(d) MFM images at room temperature for 250-nm-thick MnAs film on GaAs(001). All the images were taken from the same scan area (5x5 μm) and position. The magnetic field is applied along the easy axis of magnetization as indicated by the white arrow.

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