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Atomic Force Microscopy Incorporated with Magnetic Sample Modulation: a new approach to detect the magnetic nanomaterials JING-JIANG YU, Nanotechnology Measurements Division, Agilent Technologies, Inc., JAYNE GARNO, Department of Chemistry, Louisiana State University — A new imaging strategy using atomic force microscopy (AFM) for detecting magnetic nanomaterials with much higher spatial resolution and sensitivity than the traditional magnetic force microscopy (MFM) technique is developed [1,2]. This AFM-based imaging mode is referred to as magnetic sample modulation (MSM), since the flux of an AC-generated electromagnetic field is used to induce physical movement of magnetic nanomaterials on surfaces during imaging. The AFM is operated in contact mode using a soft, nonmagnetic tip to detect the physical motion of the sample. By slowly scanning an AFM probe across a vibrating area of the sample, the frequency and amplitude of vibration induced by the magnetic field is tracked by changes in tip deflection. Thus, the AFM tip serves as a force and motion sensor for mapping the vibrational response of magnetic nanomaterials. The investigations are facilitated by nanofabrication methods combining particle lithography with organic vapor deposition and electroless deposition of iron oxide to prepare designed test platforms of magnetic materials at nanometer length scales. Examples of detecting magnetic nanoparticles and magnetic biospecies at single molecular level will be presented [3,4].

[1] Li et al. Analytical Chemistry, 2009, 81, 4792-4802

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