

# Control of magnetic properties in magnetic nanostructures by AFM-lithography

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Lithography techniques using scanning probe microscopes (SPM) have attracted much interest as novel tools for fabricating electron devices with well-defined nanostructures. As an anodic oxidation process using the SPM, shown in Fig. 1, does not require any pretreatments such as resist coating, it is a useful tool for fabricating nanostructure materials devices [1]. We have demonstrated fabrications of magnetic nanostructures using this technique [2]. Nanoscale fabrication techniques for magnetic materials are important for developing magnetic devices such as memories and a new class of spin-related devices. In this paper, a direct modification of magnetic properties in magnetic nanostructures using atomic force microscopy (AFM) is reported as well as fabrication of planar-type spin devices [3]. Figure 2 shows anisotropic magnetoresistance (AMR) curves of NiFe strip films. Two nanowires of NiFe oxide were fabricated by the AFM, which pinned a domain wall propagation during magnetization reversal. Figure 3 shows an example of control of magnetic domains by the AFM. A magnetic anisotropy of the rectangle region fabricated by the AFM nano-oxidation was switched to a hard axis of the patterned Co film due to shape anisotropy [4].

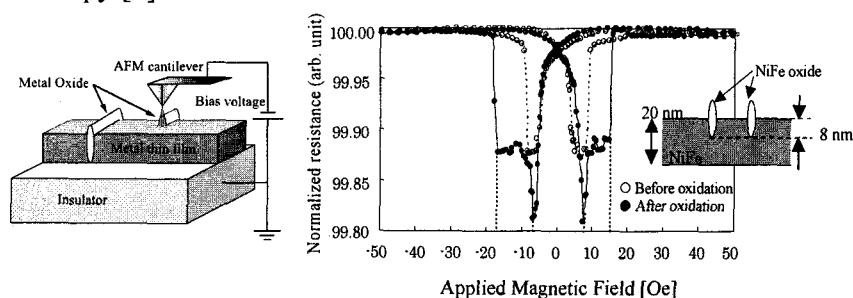


Fig. 1 AFM nano-oxidation.

Fig. 2 AMR curves of NiFe strip films with/without surface modification by AFM.

Fig. 3 Direct modification of magnetic domains in Co patterned structure. MFM image (a), simulated magnetization (b) and domains (c).

## References

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