

Magnetic force microscopy applied in magnetic data storage technology

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Microstructured thin-film elements with critical dimensions of 1 μm or less play an increasingly important role in magnetic components for information technology applications. Devices that are directly based on such microstructures are key components in magnetoelectronics for storage and sensor applications as well as modern concepts which are likely to substitute today's hard disk drives. Basic research on magnetic materials as well as industrial applications create an increasing demand for high-resolution magnetic imaging methods. One such method is magnetic force microscopy (MFM). In spite of considerable achievements, MFM also has some serious shortcomings, which have not been overcome to date. Under normal circumstances, the method yields only qualitative information about the magnetic object and it is difficult to improve the resolution to values below 100 nm. In this paper, we will report on advanced MFM probe preparation, based on electron beam methods, and discuss the possibilities for batch fabrication of such advanced MFM tips. We show that the advanced probes allow high-resolution imaging of fine magnetic structures within thin-film permalloy elements without perturbing them. Additionally, we present high-frequency MFM measurements on a hard disk write head.