Fabrication and characterization of advanced probes for magnetic force microscopy

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Advanced probes for magnetic force microscopy have been produced by e^--beam lithography and Ar^+-ion etching. The probes consist of individual CoCrPt, Fe, or Ni particles with a typical size of 100×100×100 nm^3, located at the tip apex of commercial cantilevers. They were compared to conventional thin film probes by performing magnetic force imaging on hard disc test patterns and soft garnet films. The advanced probes yield a considerable improvement in lateral resolution due to the three-dimensional confinement of the magnetically active tip volume. For soft magnetic samples the improvements are even more striking since the low stray field of the new probe allows nondestructive imaging at much smaller probe–sample spacing than achievable by conventional probes.