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Alternating Magnetic Force Microscopy: effect of Si doping on the temporal performance**degradation of amorphous FeCoB magnetic tips**

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Abstract

In order to increase the resolution of traditional MFM and extend its applications in the past, we created an Alternating Magnetic Force Microscopy (A-MFM) with a magnetic force modulation by applying an off-resonance AC magnetic field. A new magnetic tip has been developed for A-MFM in this work. Perpendicular magnetic recording medium with 500 kfc/i recording density is successfully imaged and analyzed by using the new tips coated by 6–15 nm amorphous FeCoSiB-based soft magnetic film. The effect of Si doping to the magnetic film on the A-MFM imaging was studied. It was found that Si additive had no effect on the imaging properties, such as signal-to-noise ratio and spatial resolution (kept at ~5 nm level). But on other side, Si additive significantly degraded the chemical stability of FeCoSiB film due to oxidation in ambient atmosphere. Surface passivation by metal and boron oxides is considered to have a main effect on improvement of chemical stability of Si-free magnetic coating. The results have shown that Si-free FeCoB-based magnetic tips are appropriate candidates for A-MFM imaging in ambient conditions.

1. Introduction

The current progress in the magnetic recording density have already crossed 1 Tb/in² milestone which

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