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Measurement of Side Wall Angles of Magnetic Recording Heads with a Nano-scale Pole Tip using Magnetic Force Microscopy

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Fabrication of perpendicular magnetic recording heads in hard disk drives involves many processing steps and control parameters. One of the control monitors is side wall angles of the write pole tip which is typically measured by a scanning electron microscope (SEM). SEM observation is, however, a destructive testing as magnetic recording heads were damaged by electron bombarding. This paper presents an alternative indirect method to inspect side wall angles of write head pole tips by using a magnetic force microscope (MFM). The benefit of this method is that test samples have not been damaged after inspection. During MFM imaging, magnetic recording heads under test were biased with a DC current. A high coercivity MFM probe coated with FePt was employed to ensure that a magnetic dipole moment of a MFM probe was not reversed when scanning pass through areas having strong magnetic field intensity. A MFM image was then post processed in order to calculate side wall angles of magnetic pole tips. Results obtained from MFM measurement revealed the effect of the direction of probe scanning; however, those show a good agreement with results taken by a standard SEM method.

Keywords: magnetic write heads, perpendicular magnetic recording heads, side wall angle, MFM

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