Ultra-Sensitive Cantilevers with Integrated Nanometer-Scale Magnets for Magnetic Resonance Force Microscopy

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ABSTRACT:

We are developing processes for fabricating mesoscopic cantilevers with integrated nanometer-scale magnetic tips as part of a larger effort to achieve single-proton sensitivity in magnetic resonance force microscopy. To reach this goal, the magnetic tipped cantilevers must achieve sub-attonewton force sensitivity with the magnetic tips only a few nanometers away from the surface of a sample. Significant progress has been made, especially in the area of alignment of magnetic tips with the cantilevers; however, technical challenges remain in the areas of magnet adhesion and integration of the steps in the fabrication progress. In particular, the cobalt magnets appear to be reacting with the silicon substrates during the final cantilever etch step. The resulting silicides are readily attacked by the hydrofluoric acid used to release the cantilevers, resulting in loss of the magnets. Current efforts are focused on mitigating or eliminating this effect.

KEYWORDS:

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