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Low Cost Batch Fabrication of High Aspect Ratio and Edge AFM Tips

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A serious issue with AFM is the intrinsic artifact in the AFM image when mapping a non-flat surface (e.g. a deep and narrow hole/trench). The natural solution to overcome this issue is by using thin and high aspect ratio (HAR) tips that can follow the sample surface more precisely. At present, commercial HAR tips are mostly fabricated by the very slow and costly FIB sharpening process, and the very high price greatly limits its wide-spread application. Here we will report a batch fabrication process, which can process an entire wafer of regular (low aspect ratio, low cost) tips into HAR ones, without using any lithography method.

A second issue is the tip location relative to the cantilever. Because of alignment accuracy in photolithography, most commercial AFM probes have tips 10-30 μm away from the very end of the cantilever, and it is thus impossible to know where exactly the tip is because the camera in an AFM system shows only the backside of the AFM cantilever. So the initial scanning area must be set very large in order to ensure that the area of interest is within the scanning field. It is therefore very desirable for the tip to be located at the very end of the cantilever so that it can be viewed clearly by the optical microscope of the AFM system. Here we will report a low-cost batch fabrication method to produce such “edge tip” where the tip is located at the very end of the cantilever.

Biography:

Prof. Bo Cui received PhD from Princeton University. In 2008 he joined the University of Waterloo as a professor. He currently leads the Waterloo Nanofabrication Group with 18 graduate students/postdocs. His research focus on nanofabrication technologies and its applications. In particular, his research in special AFM probe fabrication has led to two startup companies (Nanodevice Solutions Inc., and TZNano). He is the recipient of the Dobbin Scholarship. He authored 95 peer reviewed journal publications, 6 patents, three book chapters, and one book titled “Recent advances in nanofabrication techniques and applications”. He is the Associate Editor for Nanoscale Research Letters.