

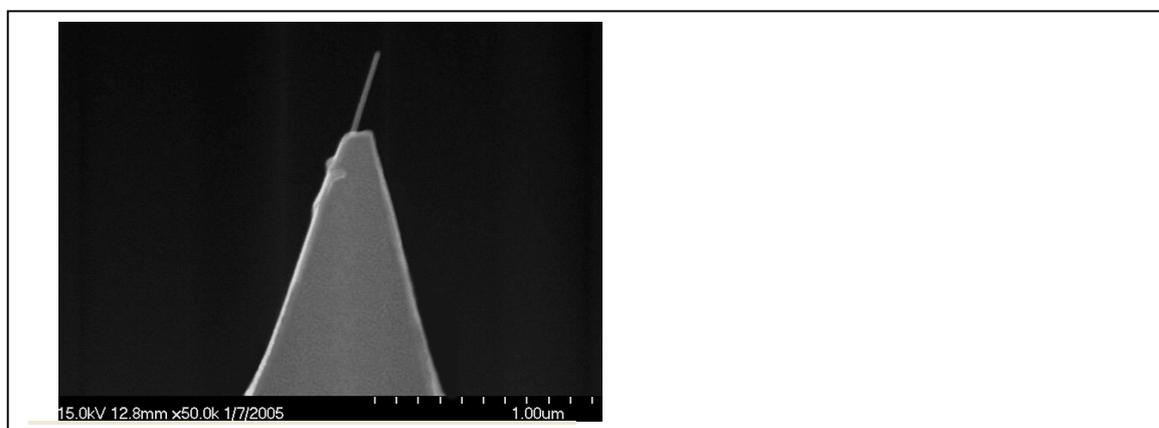
Comparative study of carbon nanotube tip for DNA imaging

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High resolution and high aspect ratio makes carbon nanotube (CNT) tip ideal for atomic force microscope. Moreover, almost no wear and high resilience give more attractive point to the CNT tip than other scanning tips [1]. So it is well known that CNT tip is very useful to measure and manipulate the biomolecules like DNA and protein [2]. Firstly, we fabricated the multi-walled carbon nanotube (MWNT) tip by dielectrophoresis which was formed under non-uniform electric field using conventional Si tip. The protruded MWNT from the Si tip apex is the 600nm in length and 20nm in diameter [3].

As the first step, we measured the general feature which can take an image with both conventional Si tip and CNT tip. The resolution of the surface image showed visually distinct difference, because the tip radius with sharp shape has much smaller van der Waals force than that of the cone-shaped general tip. Next, we measured the DNA sample on Si substrate. Even though the CNT tip is made of MWNT, and cannot expect the sub-nanometer resolution, astonishingly the DNA helix structure was shown in NCAFM imaging. On the contrary, conventional tip could not obtain a normal imaging for DNA in NCAFM mode. Finally, we tried the comparison of the image results in NCAFM and tapping AFM with the same CNT tip. We demonstrate that NCAFM and tapping AFM with a CNT tip are both available but slightly different in measuring biomolecules like DNA and protein.



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