Reference: AN006

NanoInk's C-AFM Module
for the NSCRIPTOR™ DPN® System

Conductive atomic force microcopy (C-AFM) is a modified AFM method for characterizing conductivity variations in resistive samples. The method involves using a conductive cantilever, applying a carefully controlled voltage between the tip and the sample and monitoring the resulting current flow as a function of position.

NanoInk's C-AFM Module has been designed to be used with the NSCRIPTOR DPN System. The module enables conductivity mapping of a wide range of sample conductivities while minimizing potential tip and sample damage.

To allow a much wider range of voltage and current control during conductivity mapping, the C-AFM Module provides a robust double coated conductive tip and an image control module.

Key features of the C-AFM Module include:

- Sharp silicon contact cantilevers double coated with a conductive film to make them robust and less sensitive to physical or electrical wear.

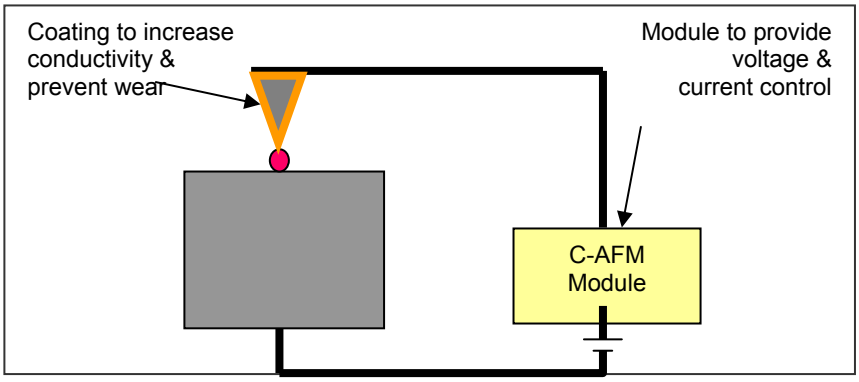

Figure 1: The C-AFM method

- A control module to provide four decades of voltage control along with four decades of current control, minimizing potential electrical damage to the tip.

In order to protect the tip and the sample, minimum voltage and current settings on the C-AFM Module are chosen before C-AFM imaging. The settings are then slowly increased until contrast is observed, and allows the user to optimize the resistances in the circuit.

An example of data taken with the C-AFM Module is shown below. First, multi-walled carbon nanotubes were mounted on end in a non-conductive matrix. The sample was imaged with normal C-AFM imaging with a standard conductive contact cantilever. Even though the samples have a resistivity of between 5 and 15kΩ, high resolution conductivity maps were difficult to obtain with conventional C-AFM because of tip degradation. This is demonstrated by the fact that the images showed only bright and dark regions with little detail (see Figure 2, images A and B). When the same sample was imaged using NanoInk's C-AFM Module, there is no visible degradation of the C-AFM image with repeated scans and considerable detail in the conductivity across the end of the nanotube considerable detail can be observed in Figures 2C and D.

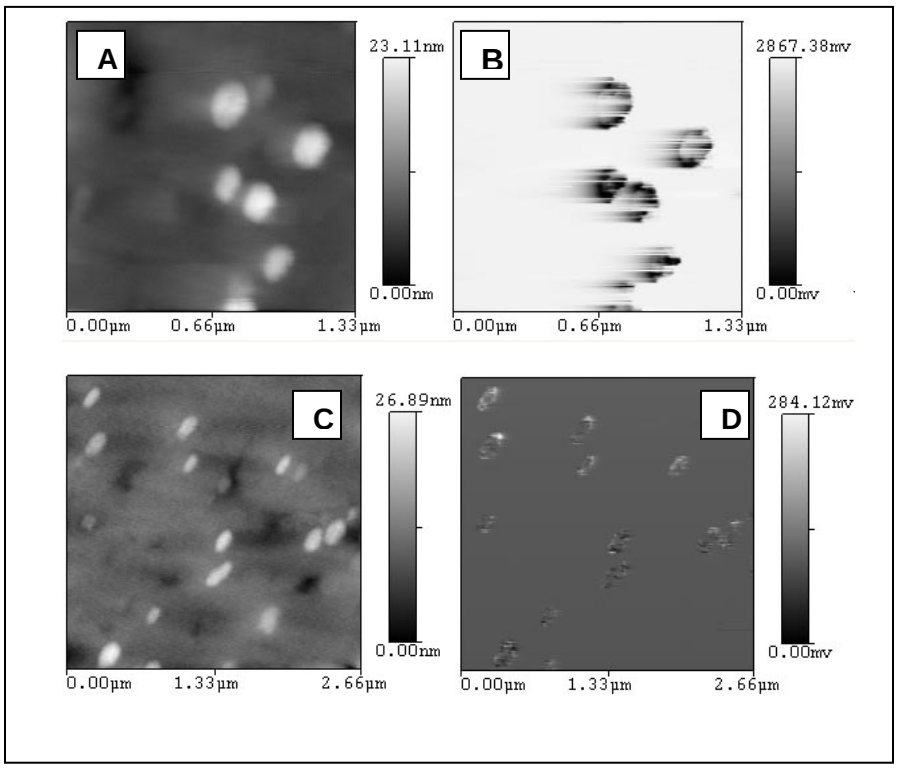

Figure 2: Images (A) and (B) are of a cross section of a carbon nanotube sample using conventional C-AFM without using NanoInk's module, showing little contrast and tip degradation. Images (C) and (D) were used with NanoInk's C-AFM Module and show no tip degradation and detailed conductivity variations.

For more information including pricing, please contact NanoInk Sales Department at sales@nanoink.net or 1-847-679-NANO.

NanoInk's C-AFM Module is derived from the Pacific Nanotechnology Incorporated SHARK™ product. Data shown is from PNI's SHARK Applications Note.