

Local Probing of Electron Transport Properties and Structure of Nanostructures Using TEM and TEM-STM

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Individual interfaces and defects determine the properties of materials and devices. It is therefore of significant interest to directly correlate the microstructure of an individual microstructural feature to its properties. The scanning tunneling microscope (STM) can provide images of surface structures and measure properties on the nanoscale and also subnanoscale. However, it is not possible to both image and measure simultaneously. It should also be noted that processes the surface are not directly accessible. The combination of a STM and a transmission electron microscopy (TEM) enables simultaneous imaging and measurements including direct imaging of the surface and the structure beneath the surface. This talk will address TEM-STM *in-situ* experiments on carbon nanotubes where electromigration has been investigated and used for obtaining a nanopipette function [1]. Methods to extract an individual carbon nanotube for insertion in the TEM-STM holder have been developed and will be described. The methods include a combined focused ion beam workstation and scanning electron microscope with an in-situ manipulator [2]. Different aspects of the extraction method will be discussed.

1. K. Svensson, H. Olin and E. Olsson, "Nanopipettes for Metal Transport", *Phys. Rev. Lett.* **93**, 145901 (2004).
2. L. de Knoop, K. Svensson, H. Pettersson and E. Olsson, "Extraction of Individual Carbon Nanotubes for Local Probing of Transport Properties", in manuscript.