CENTER OF SUPER-DIAMOND & ADVANCED FILMS

One dimensional Nanomaterials

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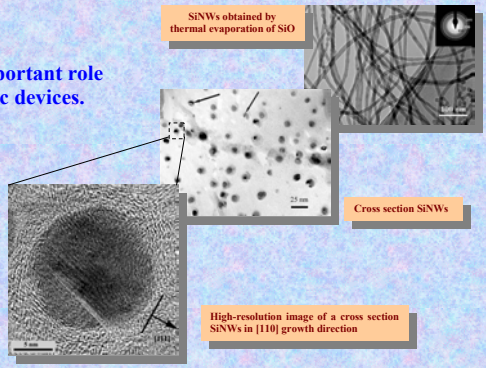
One-dimensional Nanomaterials are pushing the nanotechnology in semiconductor industry to the cutting edge nowadays. As being one of the famous laboratories in the world, we can produce different new nanomaterials in high quality and large quantity. Here we report some of the new nanomaterials as:

Silicon Nanowires (SiNWs):

SiNWs are attracting much interest recently because they are expected to play an important role as interconnects and basic components for future mesoscopic electronic and optoelectronic devices.

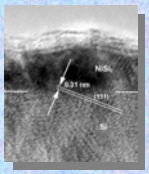
–Major issues:
- **Controlling the electrical conductivity of SiNWs,**
- **Patterning the electrical contacts to SiNWs.**

Although SiNWs can be mass-produced in our laboratory, it is hard to increase the electrical conductivity of SiNWs during the growth process. A number of strategies to provide ohmic contacts to SiNWs have been developed, including:



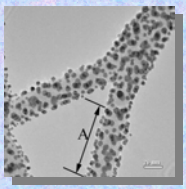
1. The formation of metal silicide layers on SiNWs by Metal Vapor Vacuum Arc (MEVVA) ion source implantation:

Ni implanted SiNWs annealed at 600 °C

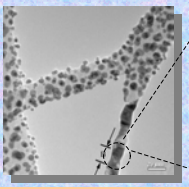


High-resolution image of Ni implanted SiNWs after annealing

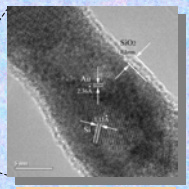
2. The deposition of gold (Au) particles/film on the surface of SiNWs:



Gold-coated SiNWs



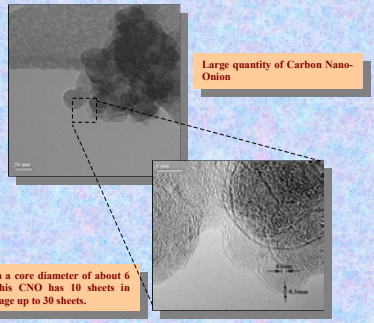
Annealing by the electron beam in the transmission electron microscope (TEM)



High-resolution image of an Gold film covering the SiNWs

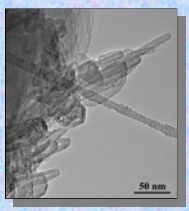
Carbon Nanotubes (CNT) and Carbon Nano Onions (CNO) by Chemical Synthesis at ambient temperature and pressure:

A simple chemical technique was used to produce multi-walled carbon nanotubes (CNT) and carbon nano-onions (CNO) at room temperature and pressure using silicon nanowires (SiNWs) as a starting material.

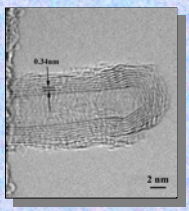


Large quantity of Carbon Nano-Onion

With a core diameter of about 6 Å, this CNO has 10 sheets in average up to 30 sheets.

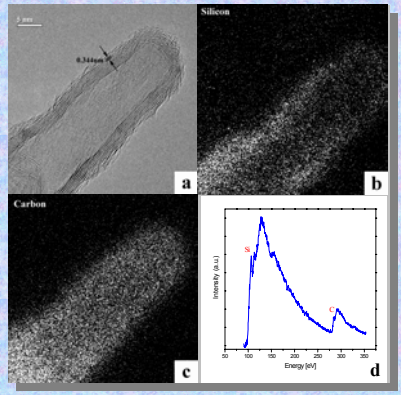


A transmission electron microscopy (TEM) micrograph showing a bunch of CNT.



A high resolution TEM micrograph showing a close-end CNT with 8 walls.

Silicon Carbon Nanotubes (SiCNT) :



(a) A high-resolution image of a close-end SiCNT with 8 walls, and elemental mapping images of (b). Silicon, (c). Carbon.
(d) An electron energy loss spectrum shows this tube is SiC.

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