

Electrochemical Deposition of Metallic and  
Semiconducting Nanowires for Nanoelectronics and  
Sensor Applications

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Manipulation and control of matter at the nano- and atomic level are crucial for the success of nano-scale sensors and actuators. The ability to control and synthesize multilayer composite structures using carbon nanotubes that will enable to build electronic devices within a nanotube is still in its infancy. In this paper, we present results on selective electrochemical deposition of metals and oxides on carbon nanotubes realizing metallic and semiconducting nanowire structures. Silver, platinum and tin oxide nanowires have been fabricated using this approach due to its applications in chemical sensing as catalytic materials and sensing films, to sniff toxic agents and in the area of biomedical nanotechnology for construction of artificial muscles using reversible electric field induced strain that is observed in nanowires. The electrochemical deposition allows the deposition of metals and oxides with high degree of selectivity on carbon nanotubes by manipulating the charges on the surface of the nanotubes. SEM and TEM investigations revealed silver, platinum and tin oxide nanowires between 10 nm-100 nm in diameter. The present technique is versatile and enables the fabrication of host of different types of metallic and semiconducting nanowires using carbon nanotube templates for nanoelectronics and myriad of sensor applications. Further, nanowires can also serve as model systems for studying quantum size effects at these dimensions. Figure 1 and 2 are the SEM results of the silver and platinum nanowires fabricated using this approach. This approach is versatile, easy and enables volumetric production of nanowires using carbon nanotube templates with high degree of selectivity. Further, applications of nanowires for electronics and nanoscale sensors and actuators will be presented and discussed.

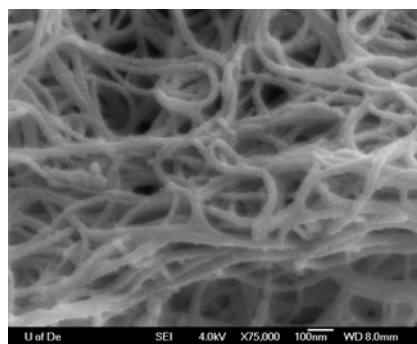


Figure 2. SEM image of platinum nanowires formed on single wall carbon nanotubes.

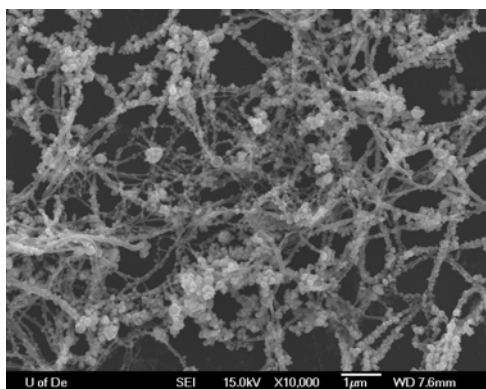


Figure 1. SEM image of silver nanowires formed on single wall carbon nanotubes