Carbon Nanotube with a Graphitic Outer Layer for Use with Atomic Force Microscopy and as an Electron Emitter

**Advantages**

- Greatly enhances the utility of carbon nanotubes
- Improves ability to handle and manipulate the nanometer size nanotubes
- Syntheses method produces carbon nanotubes with consistent shape and dimensions

**Invention**

A method for manufacturing a carbon nanotube device consisting of a carbon nanotube core with an integrally attached outer graphitic layer [U.S. Patents 6,582,673 & 7,011,884]

**Background**

Carbon nanotubes are one of the strongest and most robust materials currently under investigation. After the discovery of carbon nanotubes, scientific efforts have been focused on producing the nanotubes with higher yields and consistent dimensions. Current methods for producing carbon nanotubes give undesirably low yields with significant variations in structure and size, and often include carbon materials of different shapes.

This invention contributes to a more consistent, and predictable, method for manufacturing a particular configuration of carbon nanotubes. It also provides a solution to problems associated with handling and manipulating the small wand, which is only visible with a high-power electron microscope. Through a proprietary process, a “graphitic outer layer” defined as carbon material comprising one or more distinct structures, is intentionally formed during carbon nanotube production, and becomes an integral part of the carbon nanotube device. This outer layer provides a mechanical coupling between the nanotube and the atomic force microscope (AFM) tip, and also provides a means for the carbon nanotube to be manipulated under an optical microscope. As the components in the semiconductor and other industries continue to shrink, this invention will be of paramount importance to meet the future measurement requirements of said entities.

**Application**

This novel configuration of carbon nanotubes can be utilized as tips for an atomic force microscope (AFM), and as electron emitters for field emission electron microscopes and flat panel displays.

**Lead Inventor**

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