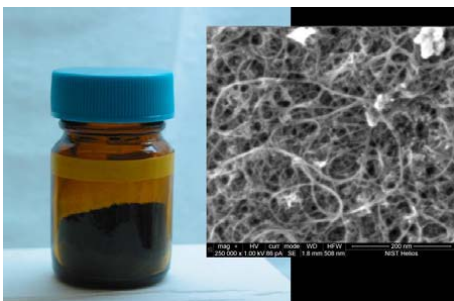


Carbon Nanomaterials Standards Efforts at NIST  
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Carbon nanomaterials are expected to play an important role in future technological developments of transistors, photovoltaics, transparent thin film conductors, sensors, and fuel cell electrodes among many potential applications. However, the potential of these materials has to date been hindered by a lack of both standard protocols (i.e. documentary standards) for determining the quality and properties of a sample material and physical standards, which allow for common intercomparison of measurements and a baseline from which developments can be made. In recent years significant efforts both at the National Institute of Standards and Technology (NIST) and in the international arena, through ISO and others, have worked to remedy these deficits.

Specifically in the area of single-wall carbon nanotubes (SWCNTs) NIST is working to produce the physical reference materials necessary to promote commerce of these materials and to address EHS concerns that may affect the long term viability of carbon nanomaterial development. Although nanotubes are theoretically expected to have tremendous optical, thermal and mechanical properties, the bundled morphology and mixture of nanotubes, catalyst, and impurities in raw soot have substantially hindered the achievement of these properties and the ability to properly address EHS concerns. Thus, to address the multiple needs of the commercial, EHS, and research communities NIST will release three SWCNT materials, a standard reference material based on a raw SWCNT soot and certified for elemental composition, as well as two reference materials, a purified SWCNT “bucky” paper and a set of three length sorted SWCNT populations in aqueous dispersion. The development and the properties of these materials will be described within this talk.



Single-Wall Carbon Nanotube Powder and Micrograph

Additionally, ongoing efforts at NIST are seeking to expand the carbon nanomaterials standards efforts at NIST beyond SWCNTs to include graphene and other carbon allotropes. The directions of this work and its application to post CMOS applications will also be discussed.