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Use of neutron activation analysis for the characterization of single-wall carbon nanotube materials

Carbon nanotubes (CNT) are one of the first major nanoscale manufactured products to enter the market. Therefore, reliable and reproducible quantitative measurement and characterization of carbon nanotube samples are important for progress in understanding of these materials and the development of new applications incorporating these materials. An additional value is the development of an information base for CNT toxicology. In response to this need, the National Institute of Standards and Technology (NIST) is developing a single-wall carbon nanotube (SWCNT) Standard Reference Material (SRM). In the course of this work, instrumental neutron activation analysis (INAA) was used to evaluate a variety of SWCNT materials for selection as a candidate reference material as well as to establish elemental composition data on SWCNT materials. INAA proved to be well-suited for the direct determination of catalyst and contaminant trace elements requiring only minimal sample preparation. Prompt gamma neutron activation analysis (PGAA) complemented the INAA data in particular with determinations of the light elements. Carbon and hydrogen results provided information on the materials purity and storage properties. INAA and PGAA data were used in the value assignment of mass fractions of catalyst and trace elements in the candidate SRM.

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