Poster

DEVELOPMENT OF BIOSENSORS BASED ON SINGLE WALL CARBON NANOTUBES AND APTAMERS

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Single wall carbon nanotubes (SWCNTs) [1] based biosensors have received a great deal of attention due to their applications in disease diagnosis, environmental monitoring, food analysis etc. The development of an effective DNA-sensing system with the potential for genomic sequencing, mutation detection, and pathogen identification is extremely important. DNA immobilization on SWCNTs [2] can be considered as the fundamental methodology for the development of DNA biosensors. Covalent attachment of DNA primers to chemically functionalized SWCNTs has been used in the development of DNA biosensors [3]. In order to attach DNA molecules onto SWCNTs, we covalently functionalized SWCNTs with carboxylic acid groups [4] resulted in the "shortening" of SWCNTs (Figs. A&B). The products obtained were characterized by X-ray Photoelectron Spectroscopy (XPS) and Transmission Electron Microscopy (TEM). Single strands of DNA with a terminal primary amine group were covalently attached to these oxidized SWCNTs via an amide bond, after activating the carboxylic acid group on SWCNTs using two methods [5]. In the first method, carboxylic acid groups were activated using disuccinimide carbonate and in the second method the activation of carboxylic acid groups was achieved by 1-ethyl-(3-dimethyl amino-propyl) carbodiimide. XPS and TEM were used to characterize SWCNT samples for the presence of DNA. Thus, by chemically grafting single stranded DNA (ssDNA) on length-shortened SWCNTs resulted in the selective and sensitive detection of complementary DNA. The development of a bio carbon nanotube array in which SWCNTs were attached to an electrode through DNA could be used for the detection of complementary DNA which can be achieved by a methodology that involves the formation of an electric signal.

References:

[1] Iijima, S, Ichihashi, T. Nature, **363** (1993) 603-605.

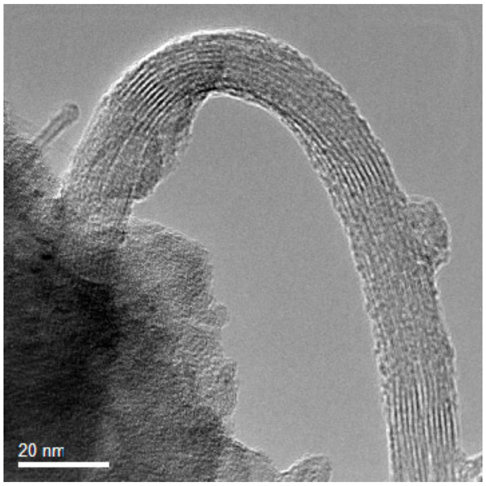
[2] Wang, S. G et al. Biochem. Biophys. Res. Commun. **325** (2004), 1433-1437.

[3] Baker, S. E et al. Nano Lett. **2** (2002), 1413-1417.

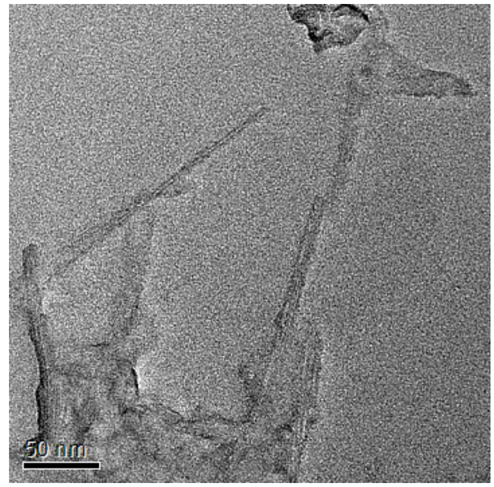
[4] Liu, J. et al. Science, **280** (1998)**,** 1253-1255.

[5] Yang, W et al. Chemical Physics Letters, **443** (2007), 169-172.

Figures:



A



B

Fig A- TEM image of SWCNTs

Fig B- TEM image of isolated shortened SWCNTs