CARBON NANOTUBES AND NUCLEIC ACIDS: TOOLS AND TARGETS

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Nucleic acids, with their intrinsic structural properties as well as their high specificity, are playing an important role in the rapid development of nano-technologies. In turn, these new technologies and their efficient performance enable fast and precise methods for detection of nucleic acids, improving the diagnosis of diseases and identification of pathogens.

I will discuss the use of nucleic acids to disperse and sort carbon nanotubes (CNTs), and carbon nanotube-based field effect transistors (CNT-FETs) to electrically detect specific nucleic acid sequences. Both DNA and RNA are efficient agents for dispersion and separation of CNTs by diameter and chirality. In particular, $d(GT)_{30}$:CNT hybrids can be fractionated by different chiralities in an anionic exchange chromatographic column. Fractions enriched in a narrow band gap distribution of semiconductors significantly improve the electronic performance of field effect transistors. A CNT-FET fulfills the requirements for a nano-sensing device that can greatly exceed the existing technologies. Electrical detection of specific nucleic acid sequence overcomes the current limitations of optical detection, by increasing sensitivity and speed, while reducing sample manipulation, size, and cost.