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THE ANALYST
www.rsc.org/analyst

Carbon-nanotube-modified glassy carbon electrodes for amplified label-free electrochemical detection of DNA hybridization

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Received 25th March 2003, Accepted 13th June 2003
First published as an Advance Article on the web 23rd June 2003

The preparation and attractive performance of carbon-nanotube modified glassy-carbon (CNT/GC) electrodes for improved detection of purines, nucleic acids, and DNA hybridization are described. The surface-confined multiwall carbon-nanotube (MWCNT) facilitates the adsorptive accumulation of the guanine nucleobase and greatly enhances its oxidation signal. The advantages of CNT/GC electrodes are illustrated from comparison to the common unmodified glassy carbon, carbon paste and graphite pencil electrodes. The dramatic amplification of the guanine signal has been combined with a label-free electrical detection of DNA hybridization. Factors influencing the enhancement of the guanine signal are assessed and optimized. The performance characteristics of the amplified label-free electrochemical detection of DNA hybridization are reported in connection to measurements of nucleic-acid segments related to the breast-cancer BRCA1 gene.