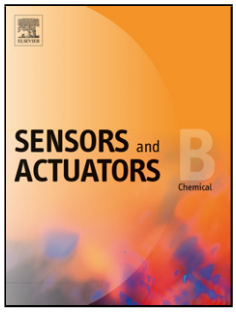

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Carbon nanodots based biosensors for gene mutation detection

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Highlights

- Carbon nanodots (CDs) modified disposable electrodes
- Electrochemical DNA biosensor based on carbon nanodots (CDs).
- Disposable biosensor for gene mutation detection in real PCR samples

Abstract

An electrochemical DNA biosensor based on a carbon nanodots (CDs) modified screen-printed gold electrode as a transducer is reported in this work. CDs were synthesized by thermal carbonization of ethyleneglycol bis-(2-aminoethylether)-N,N,N',N'-tetraacetic acid (EGTA) and characterized by different techniques (DLS, TEM, FTIR, Raman). The electrode surface modification was accomplished by drop-casting a suspension of CDs. SEM analysis and cyclic voltammetry were used to characterize the resulting modified electrode. Synthetic 25-mer or 100-mer DNA capture probes, capable to hybridize with a specific sequence of the pathogen *Helicobacter pylori* or the cystic fibrosis transmembrane regulator (CFTR) gene were attached to the CDs-gold surface. A 25-bases synthetic fully complementary sequence or a single nucleotide polymorphism to the DNA capture probe and a 373-bases PCR amplicon of exon 11 of CFTR containing a sequence complementary to the capture probe, were employed as target. The hybridization event was electrochemically monitored by using safranine as redox indicator, which selectively binds to double stranded DNA (dsDNA). A detection limit of 0.16 nM was obtained for the 25-mer synthetic target DNA. The biosensor shows a very high reproducibility and selectivity, allowing to detect a single nucleotide polymorphism. It has been applied to the detection of F508del mutation in the CFTR gene.