Supporting Information

for

Rapid and sensitive detection of box turtles using an electrochemical DNA biosensor based on a gold/graphene nanocomposite

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Materials, methods and tables

Materials and Methods

Materials

All the chemicals were of analytical grade. NaOH, KCl, KNO$_3$, K$_4$[Fe(CN)$_6$], H$_2$SO$_4$, HCl, Na$_2$HPO$_4$.7H$_2$O, KH$_2$PO$_4$, NaH$_2$PO$_4$.H$_2$O were purchased from Merck (Germany). NaCl was purchased from John Kollin (USA) and Na$_2$HPO$_4$ and trisodium citrate from Systerm (Malaysia). Graphene was synthesised in this laboratory and AuNPs were purchased from Cytodiagnostics (Canada). Tris (2-carboxyethyl) phosphine (TCEP) was purchased from Acros Organics, Thermo Fisher scientific (Malaysia). All aqueous solutions were prepared with 18.2 MΩ cm ultra-pure water from PURELAB Classic (ELGA VEOLIA, UK).

Apparatus

Cyclic voltammetry (CV), DPV, and electrochemical impedance spectroscopy (EIS) were conducted by using the Metrohm µAutolab potentiostat/galvanostat with the NOVA 2.1.4 software (Metrohm, Switzerland). SPCE was collected from Metrohm (Switzerland). Other equipment used were a pH metre from Sartorius (Germany), a microcentrifuge from Sigma (Germany), an analytical balance from Merck (Germany), and a stirrer from PMC (Barnstead/Thermolyne, USA).

Table S1: Comparison of FTIR peaks for different nanoparticles and their composites.

Materials											
				Major peaks (at cm^{-1})							
Gr	3734	2357 (downward)	2165	1964	1561	1397	1162	957	737	679	613
AuNPs/Gr	3704	2299 (downward)	2159	1986	1586	1411	1149	920	721	671	606
DNA/AuNPs/Gr	3721	2310 (upward)	2019	1922 (almost disappear)	1569	1413 (Almost disappear)	1254 (disappear)	disappear	795	721	626

Table S2: Peak current and current density of the hybridised DNAs based on DPV.

Sl.	Nucleotide sources	Peak current (µA)	Peak current density (µA/cm^2)
1	ssBT	3.61	32.82
2	dsBTRC	20.06	182.36
3	dsPK1MN	6.42	58.36
4	dsPK3MN	4.11	37.36
5	dsNC	3.69	33.55
6	dsCW	4.61	41.91
7	dsBF	4.81	43.73
8	dsHR	4.69	42.64
9	dsDK	4.31	39.18

Table S3: Peak current and current density for sensitivity analysis based on DPV results.

Sl.	Nucleotide (concentration)	Peak current (µA)	Peak current density (µA/cm^2)
A	1×10^{-15}	6.38	58.00
B	1×10^{-14}	6.57	59.73
C	1×10^{-13}	6.96	63.27
D	1×10^{-12}	7.51	68.27
E	1×10^{-11}	8.27	75.18
F	1×10^{-10}	9.86	89.64
G	1×10^{-9}	11.98	108.91
H	1×10^{-8}	13.33	121.18
I	1×10^{-7}	15.17	137.91
J	1×10^{-6}	16.81	152.82
K	5×10^{-6}	18.84	171.27
L	1×10^{-5}	19.32	175.64

Table S4: Peak current and current density for real samples related to BT.

Sl.	Samples	Peak current (μA)	Peak current density (μA/cm^2)
1	ssBT	3.2	29.09
2	dsBTS	14.88	135.27
3	dsCWS	4.41	40.09
4	dsBFS	4.93	44.82
5	dsHRS	4.55	41.36
6	dsDKS	4.09	37.18