Supporting Information

Enhanced Electrochemical Activity of Hollow Carbon Sphere/Polyaniline-based Electrochemical Biosensor for HBV DNA Marker Detection

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Fig. S1. Cyclic voltammograms of (A) HCS-PANI/GC electrode, (B) Au/HCS-PANI/GCE at different potential scan rates (C & D) The logarithm of the current versus the logarithm of the scan rate, in 0.05M phosphate buffer solution. The range of potential scan rate is 25 to 300 mVs^{-1}.

Fig. S2. (A) Cyclic Voltammograms and (B) Differential Pulse Voltammograms of (a) Au/HCS-PANI/GCE (b) ssDNA/Au/HCS-PANI/GCE, in phosphate buffer, 0.05 M.

Fig. S3. Effect of (A) incubation temperature and (B) incubation time on the peak current difference for 10 pM of complementary HBV DNA.

Fig. S4. Differential pulse voltammograms of DNA/Au/HCS-PANI/GCE in (a) blank (b) non-complementary, (c) 3-MM, solution of 100 pM HBV DNA.

Fig. S5. (A) Differential pulse voltammograms for different concentrations of HBV target DNA in 1% bovine serum albumin without processing. (B) The corresponding calibration curve of the current differences versus the logarithm of concentrations. (Inset S4A. Differential pulse voltammograms in presence of 1% serum of human blood serum for 90 minutes at 45 ^{o}C)

Table S1. The calculated active microscopic surface area for the GCE electrode and various modified electrodes, in a 0.1 M KCl containing 1 mM $[Fe(CN)_6]^{3-/4-}$.

Table S2. The R_{ct} and R_s parameters of the Au/HCS-PANI/GC electrode in various steps of modification with DNA, in a 0.1 M KCl containing 1 mM $[Fe(CN)_6]^{3-/4-}$.

Table S3. Some of the reported electrochemical biosensors based on the inherent peak of the modifier for different biomolecules detection.

Fig. S1

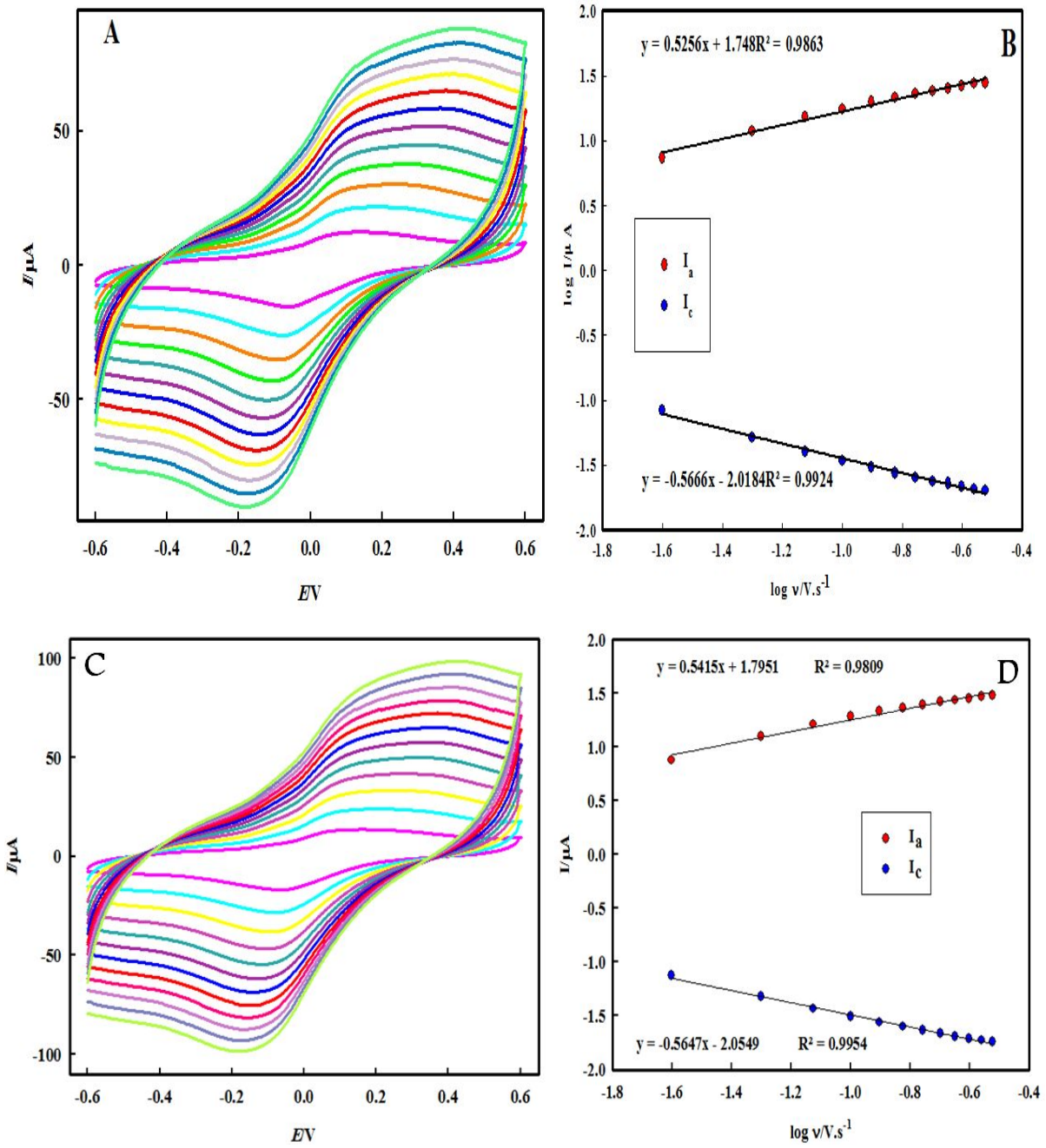
A
I/μA
EV
B
y = 0.5256x + 1.748R² = 0.9863
y = -0.5666x - 2.0184R² = 0.9924
Ia
Ic
log I/μA
log v/V.s-1
C
I/μA
EV
D
y = 0.5415x + 1.7951 R² = 0.9809
y = -0.5647x - 2.0549 R² = 0.9954
Ia
Ic
I/μA
log v/V.s-1

Fig. S2

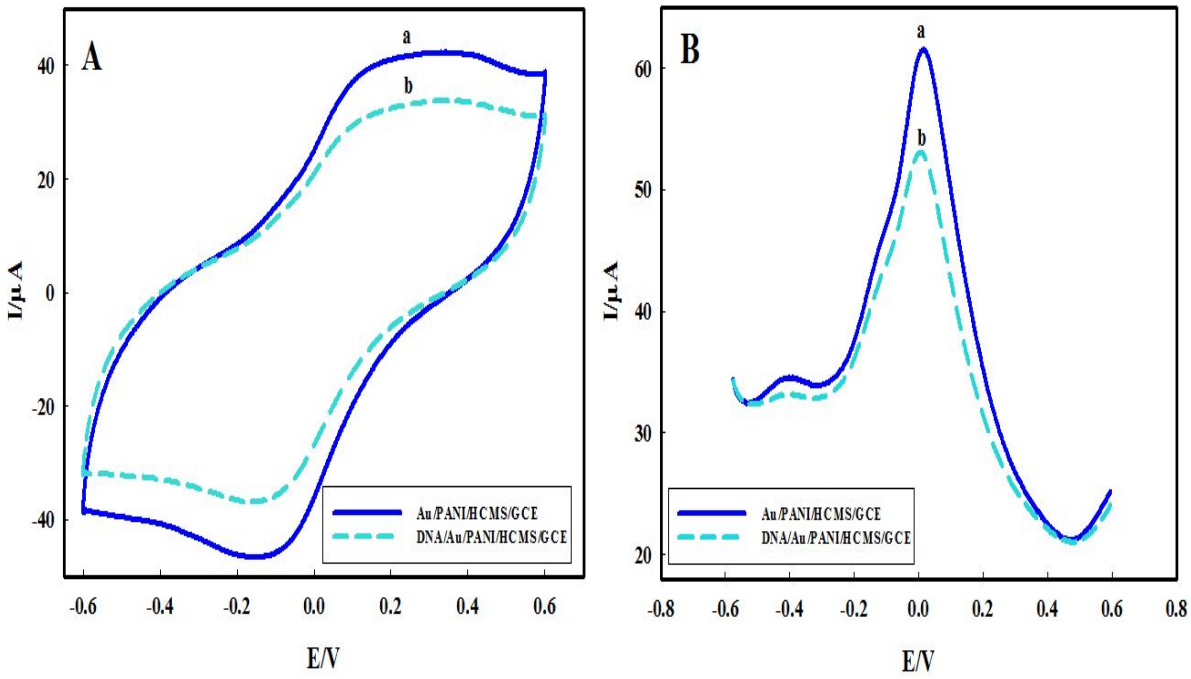
A
a
b
40
20
0
-20
-40
I/μ.A
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
E/V
Au/PANI/HCMS/GCE
DNA/Au/PANI/HCMS/GCE
B
a
b
60
50
40
30
20
I/μ.A
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
E/V
Au/PANI/HCMS/GCE
DNA/Au/PANI/HCMS/GCE

Fig. S3

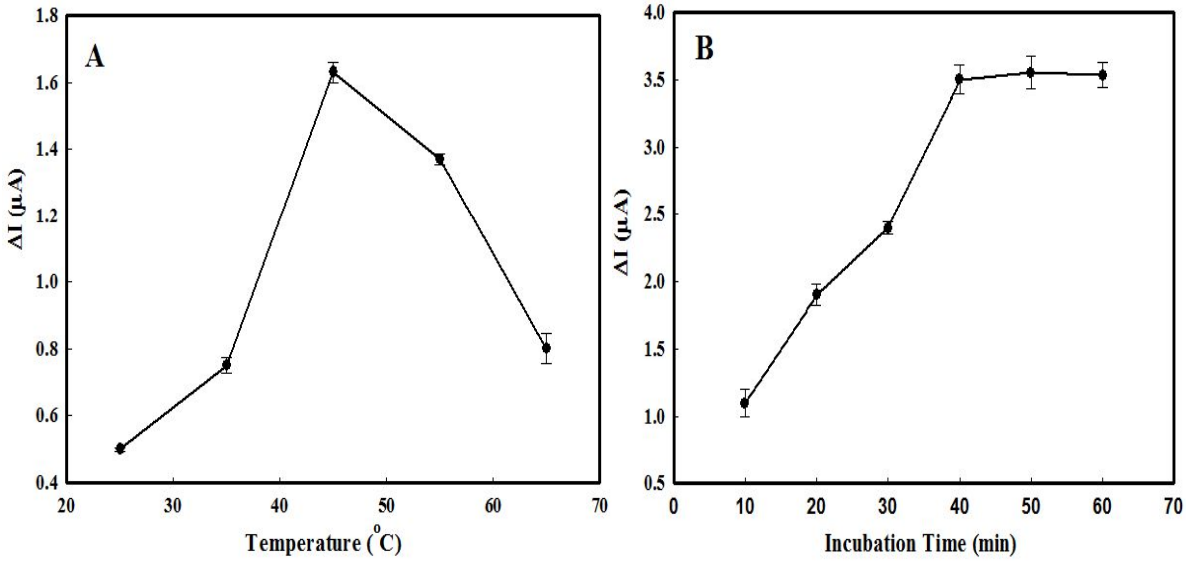

Fig. S4

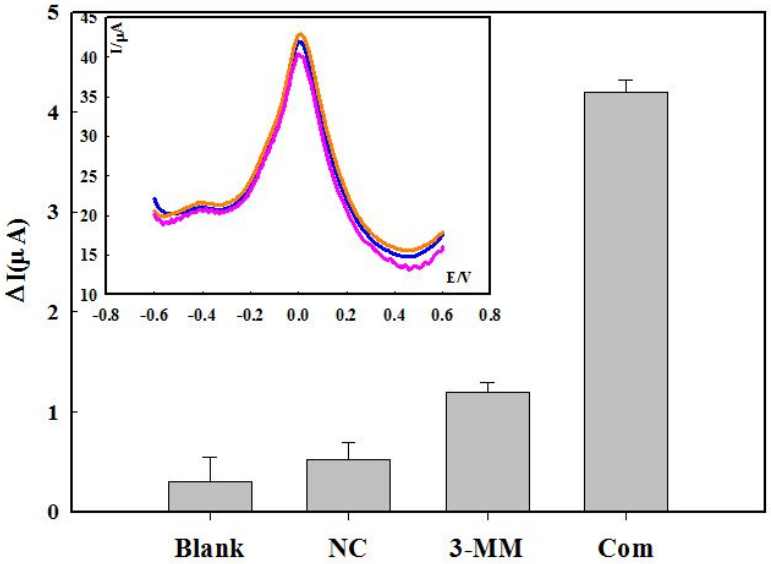
ΔI(μA)
0
1
2
3
4
5
Blank
NC
3-MM
Com
I/μA
E/V
10
15
20
25
30
35
40
45
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8

Fig. S5

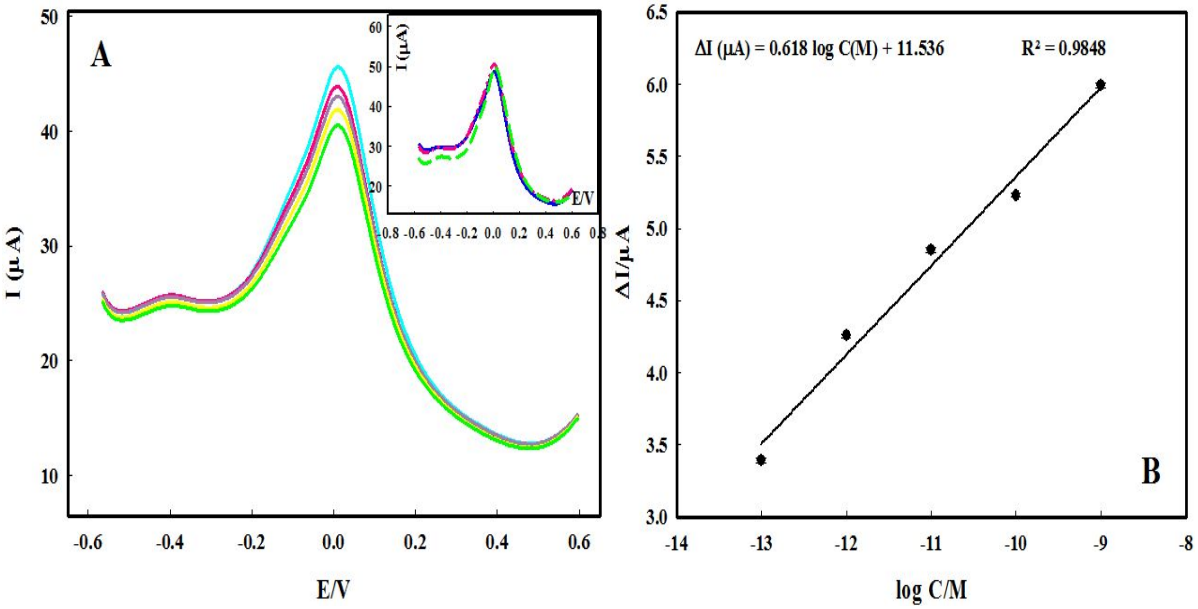

Table 1.

Electrode	GCE	HCS/GCE	PANI-HCS/GCE	Au/PANI-HCS/GCE
A (cm^2)	0.051	0.088	0.116	0.133

Table 2.

Au/HCS-PANI/GCE	R_{ct}	R_s
ssDNA	37012	202.2
ssDNA+1 pM	51375	144.32
ssDNA+100 pM	55988	180.55

Table S3.

Electrode	Redox Species	Tec	Analyte	Linear Range	LOD
Au-NPs/pTh /graphene/GCE[1]	Thionine	DPV	DNA 25nt (ABS pH 5.5)	0.1 pM – 10 nM	35 fM
/ $[Cu(phen)_2]^{2+}$ graphene /GCE[2]	Cu Complex	SWV	DNA 28nt (PBS 7.4)	1 µM - 1 pM	0.2 fM
Fc-acid-OMPA[3]	Fc	CV	Mycobacterium tuberculosis ($LiClO_4$, 7.0)	100 pM - 1 fM	0.2 fM
porous PANI/GCE[4]	PANI	DPV	AFP (PBS 5.7)	10 fM - 10 nM	0.37 fM
Au NPs/TB–GO/GCE[5]	TB	DPV	AFP (PBS 7.0)	10 pM – 1 nM	2.95 fM
AuNP/Thi-rGO[6]	Thionine	DPV	DNA 22nt (PBS 6.8)	10 aM – 1 pM	0.428 aM
MoS_2-Thi-AuNPs/GCE[7]	Thionine	SWV	miRNA-21 (PBS 7.4)	1 pM – 10 nM	0.26 pM
AP-GNs/GCE[8]	azophloxine	DPV	c-HIV (PBS 6.8)	1 fM – 10 pM	0.4 fM
Au/PANI-HCMS/GCE (This work)	PANI	DPV	HBV DNA (PBS 7.0)	0.01 pM – 1 nM	3.62 fM

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