Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting information

Optimized DNA based biosensor for *Leishmania spp.* monitoring in human plasma samples using biomacromolecules interaction: A novel platform for infectious disease diagnosis

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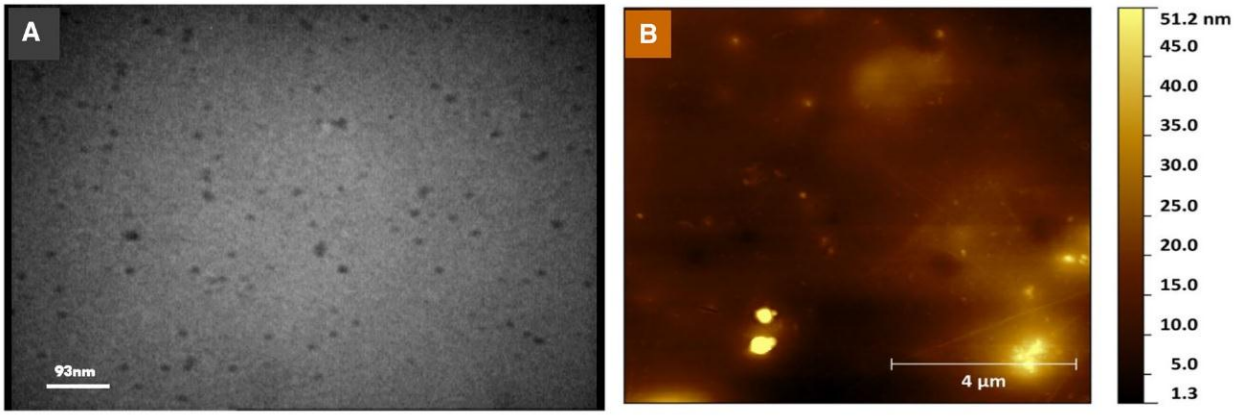


Fig. S1. A) TEM and **B)** FEM images of GQDs.

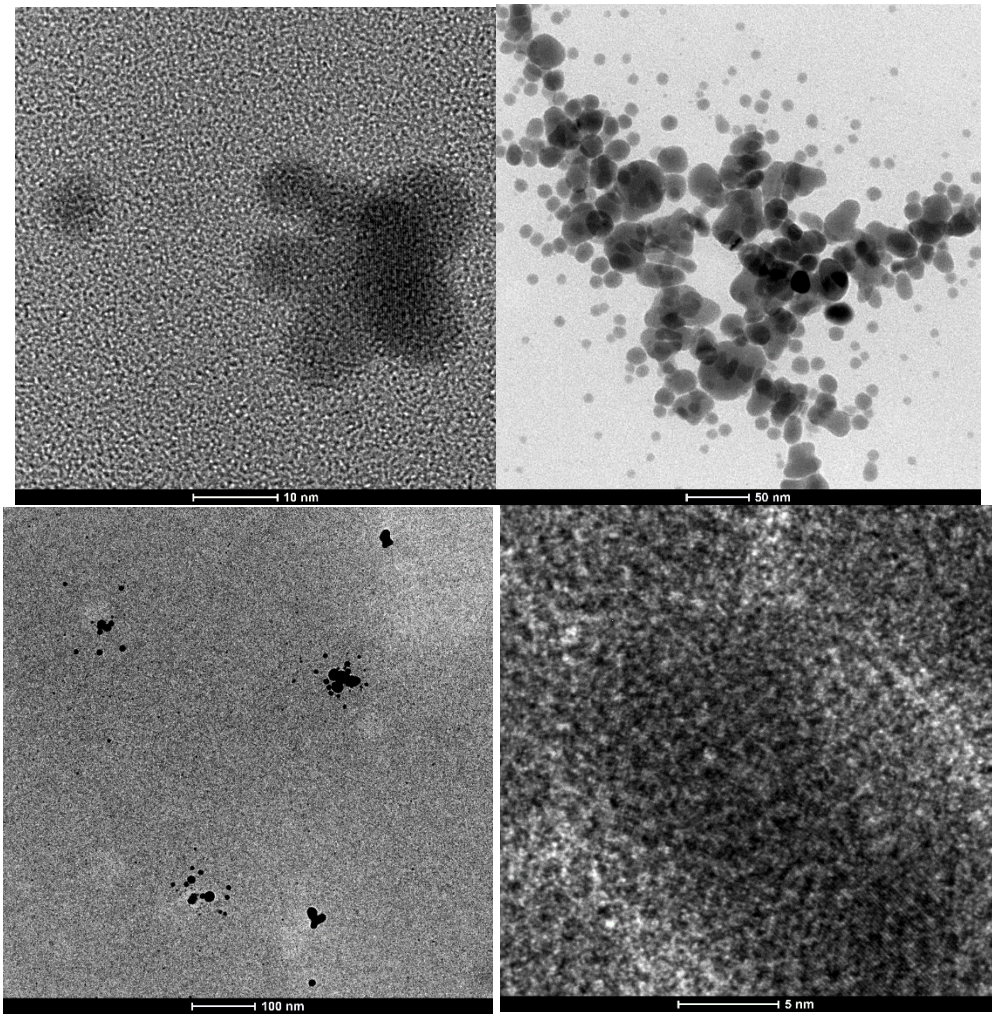


Fig. S2: TEM images of AgNPrs in different magnification.

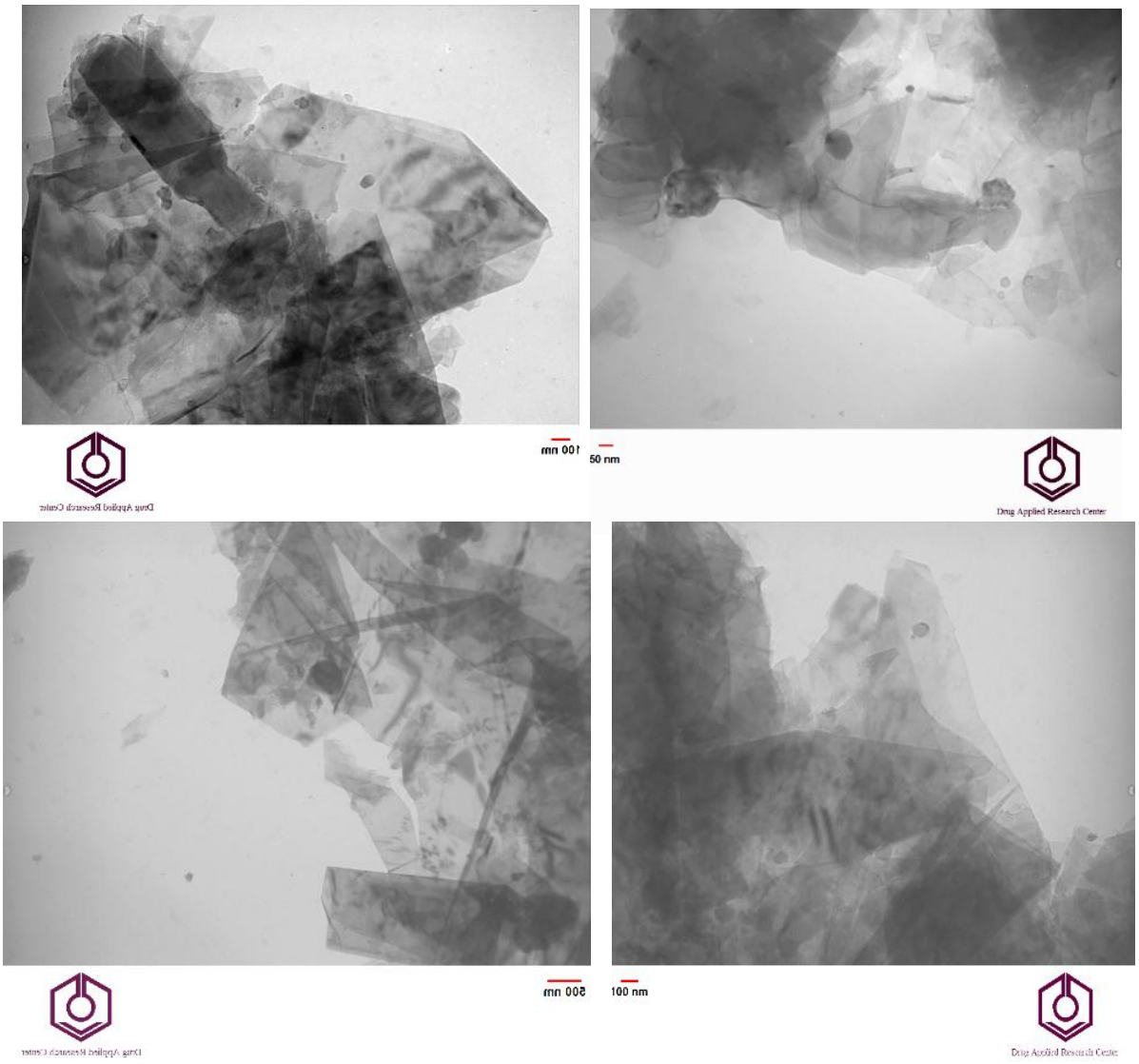


Fig.S3. *TEM images of the bulk Ag NPr /GQDs nano-ink.*

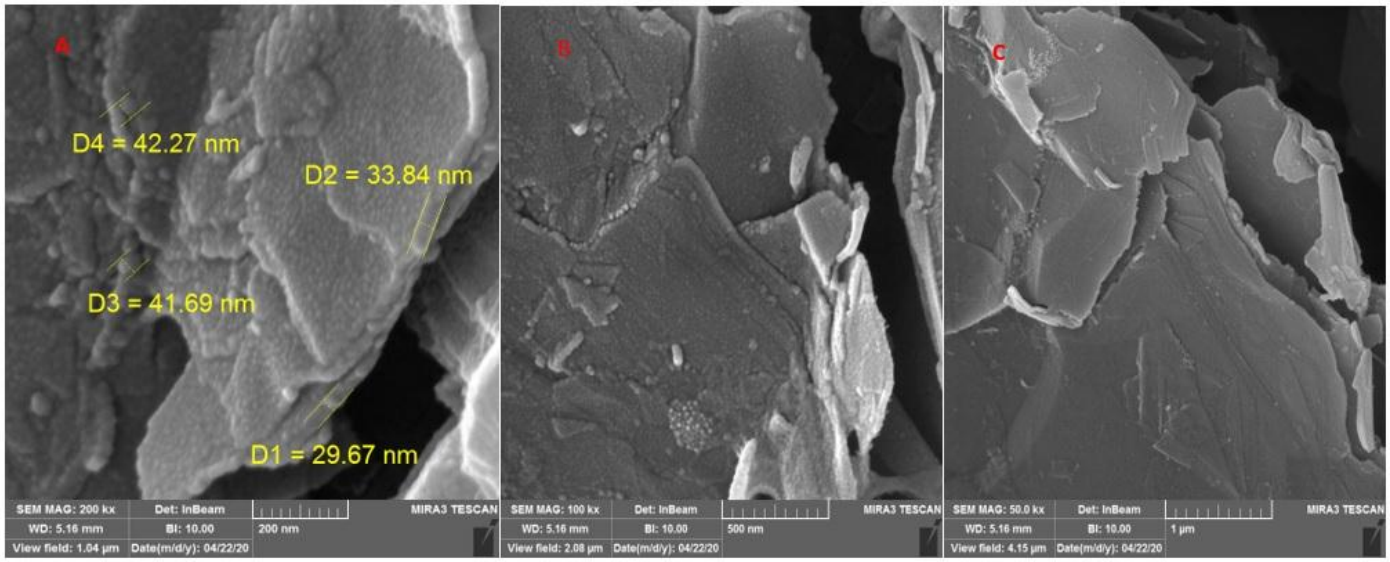
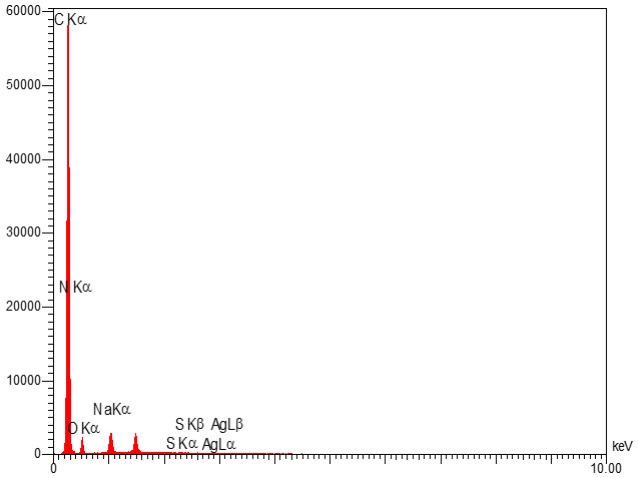
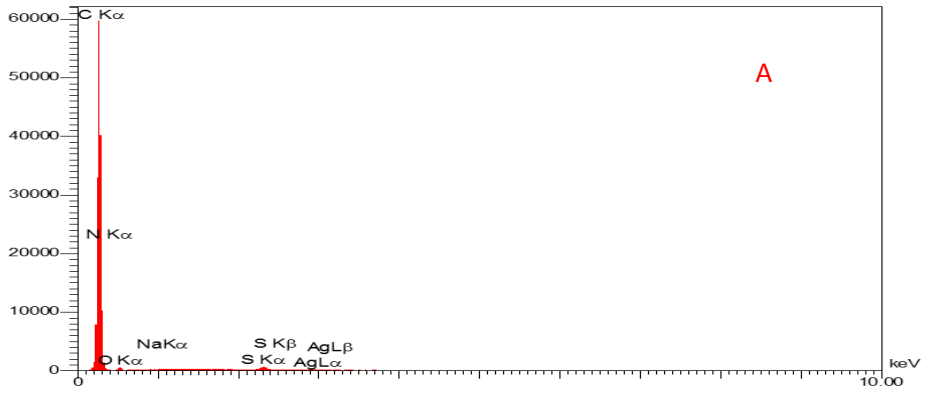


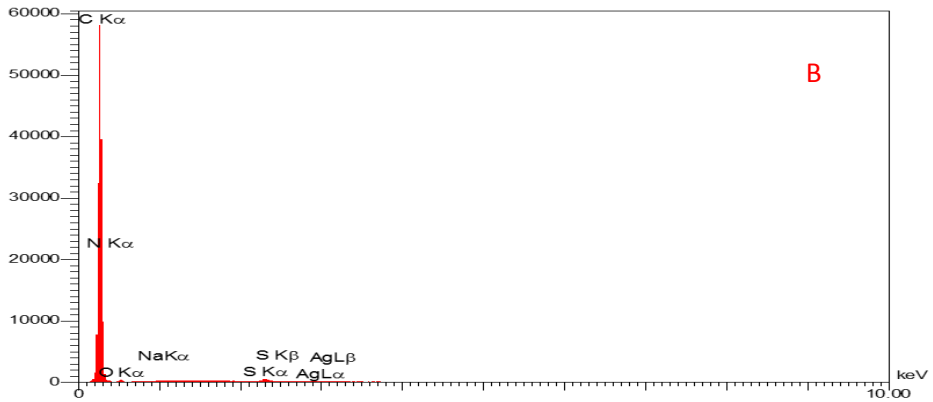
Fig. S4. *FE-SEM images of the bulk Ag NPr /GQDs nano-ink.* ***(A to C)***

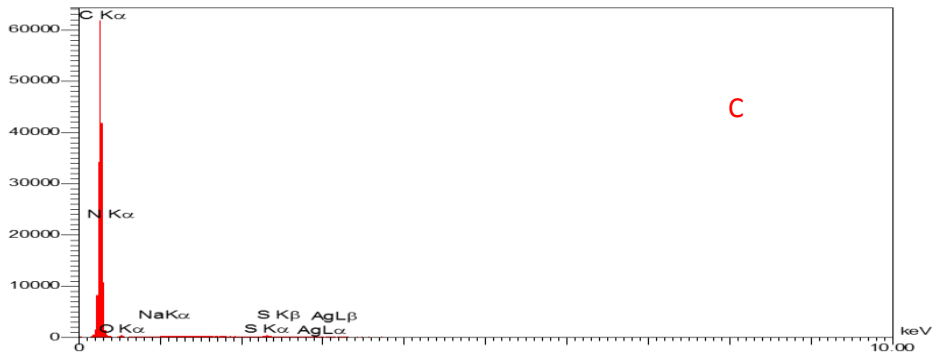


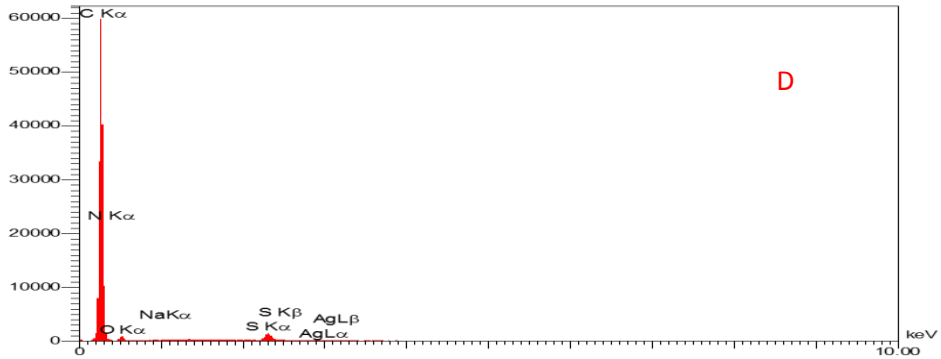
Elt	Int	W%	A%
C	3415.4	87.42	91.10
N	19.7	4.92	4.40
O	29.0	3.96	3.10
Na	25.7	0.88	0.48
S	92.8	2.17	0.85
Ag	22.5	0.64	0.07
		100.00	100.00

Fig. S5. *EDS spectra of bulk Ag NPr/GQDs nano-ink.*


A
C Kα
N Kα
O Kα
NaKα
S Kβ
AgLβ
S Kα
AgLα
60000
50000
40000
30000
20000
10000
0
0
10.00
keV


B
C Kα
N Kα
O Kα
NaKα
S Kβ
AgLβ
S Kα
AgLα
60000
50000
40000
30000
20000
10000
0
0
10.00
keV


C
C Kα
N Kα
O Kα
NaKα
S Kβ
AgLβ
S Kα
AgLα
60000
50000
40000
30000
20000
10000
0
0
10.00
keV


D
C Kα
N Kα
O Kα
NaKα
S Kβ
AgLβ
S Kα
AgLα
60000
50000
40000
30000
20000
10000
0
0
10.00
keV

Elt	Int	W%	A%
C	3415.4	87.42	91.10
N	19.7	4.92	4.40
O	29.0	3.96	3.10
Na	25.7	0.88	0.48
S	92.8	2.17	0.85
Ag	22.5	0.64	0.07
		100.00	100.00

Fig. S6. (A)*EDC images of the Ag NPr /GQDs nano-ink.* ***(B)*** *EDC images of the Au NPs-Cys modified Ag NRs /GQDs nano-ink. (Au NPs-Cys/ Ag NPr /GQDs nano ink),* ***(C)*** *EDC images of Au NPs-Cys/ Ag NPr /GQDs nano ink /p DNA****(D)*** *EDC images of Au NPs-Cys/ Ag NPr /GQDs nano ink /pDNA/MCE/TB/c DNA, deposited on the surface of paper electrode.*

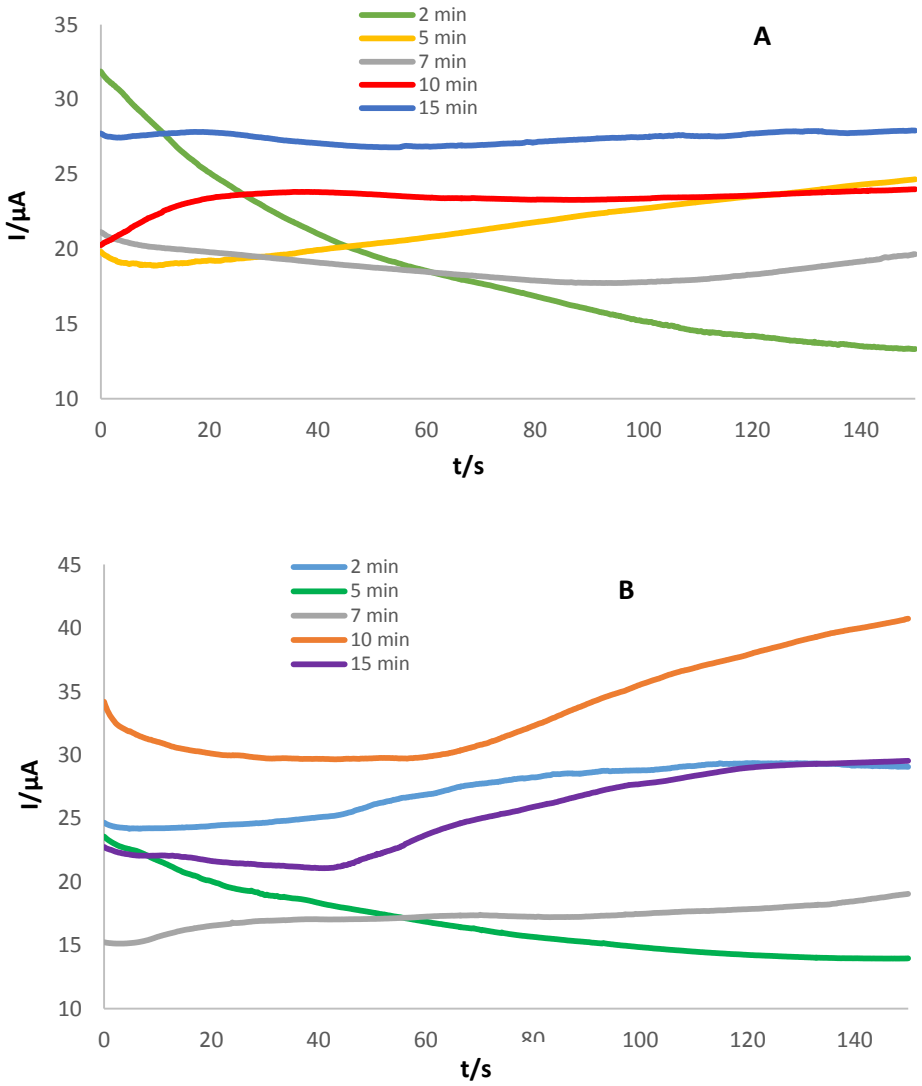


Fig. S7. *ChAs of the biosensor after TB incubation in various times (2- 5- 7- 10-15 min):* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E= 0.2 V, duration time= 150 s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*

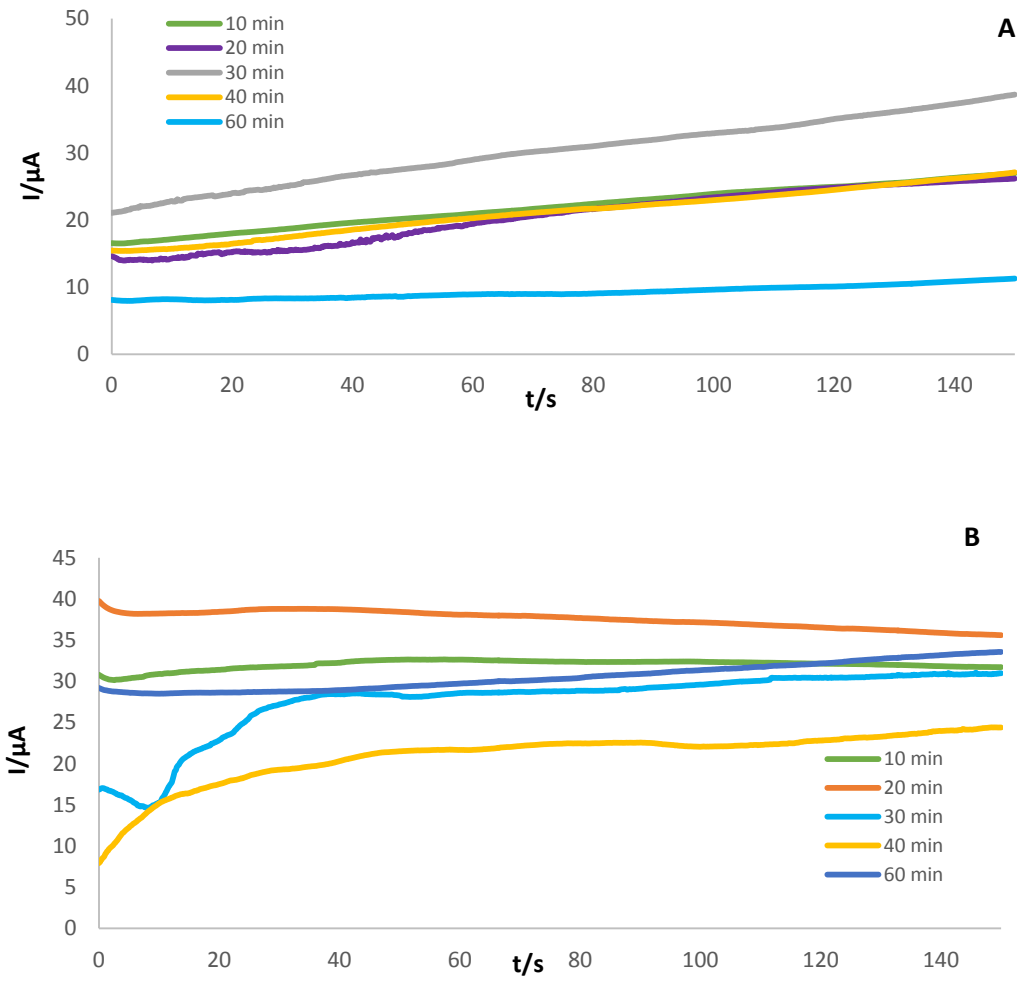


Fig. S8. *ChAs of the biosensor after target ssDNA incubation in various times (10-20-30-40-60 min):* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E= 0.2 V, duration time= 150 s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*

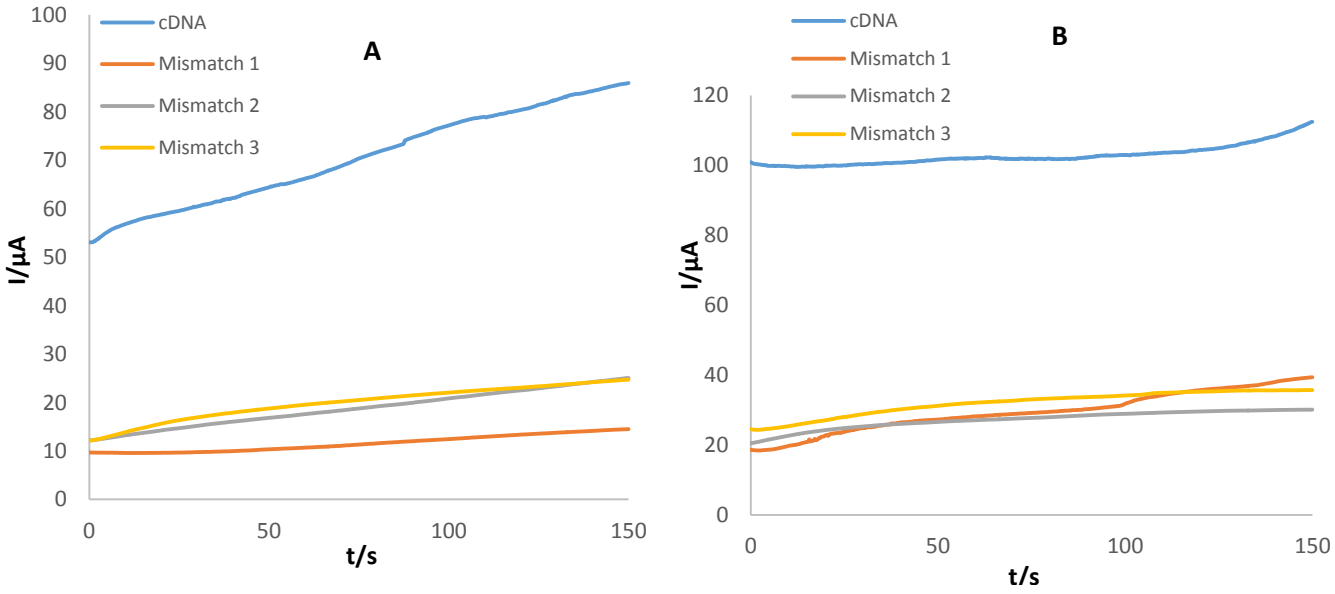


Fig. S9. *ChAs of the engineered genosensor for hybridization by target ssDNA, one-mismatch, two mismatch and three-mismatched DNA.* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E= 0.2 V, duration time= 150 s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*

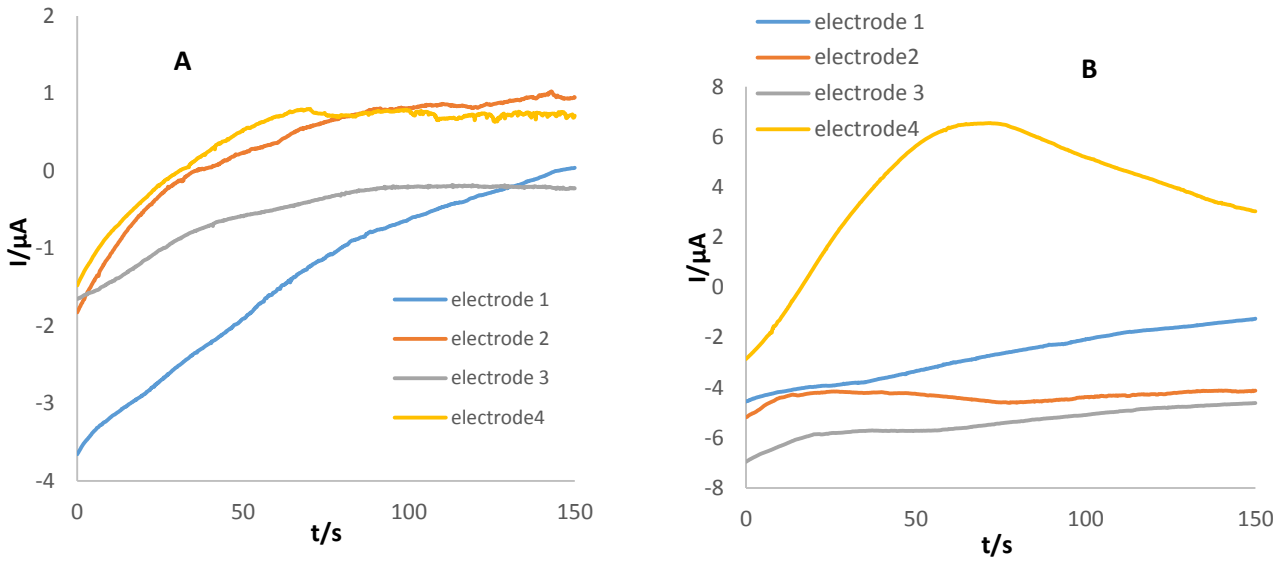


Fig. S10. *Inter-electrode reproducibility of Au NPs-Cys/Ag NPr/GQDs nano ink/paper electrodes.* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E= 0.2 V, duration time= 150 s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*

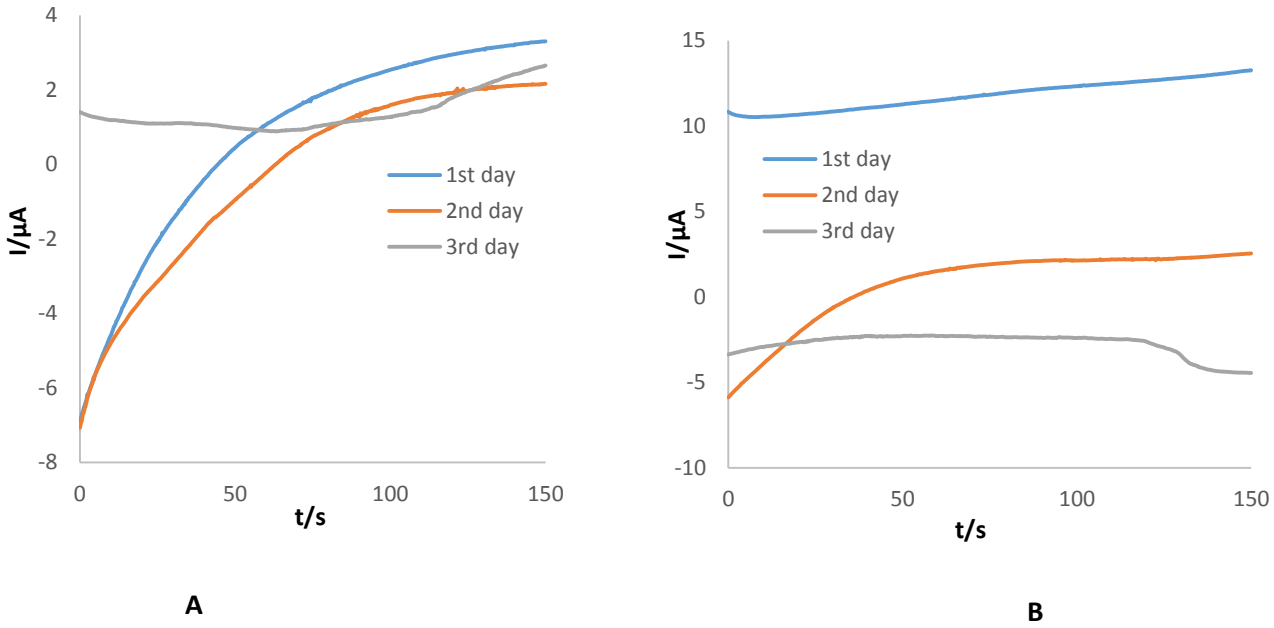
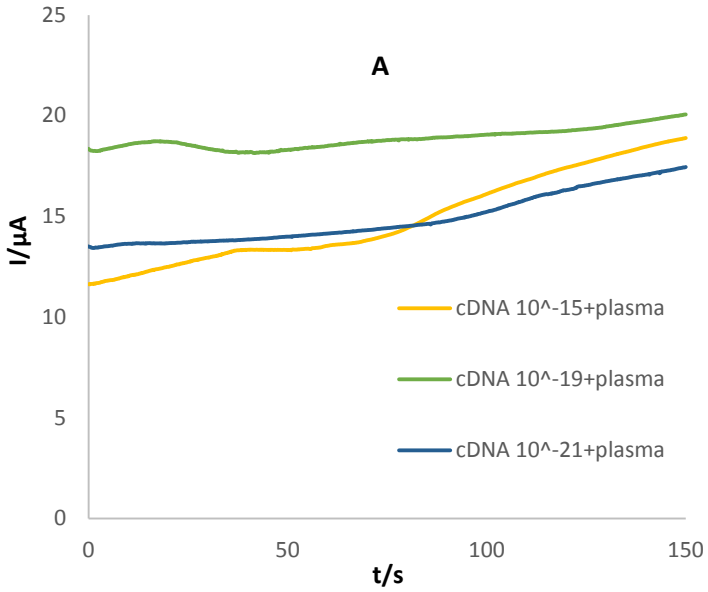
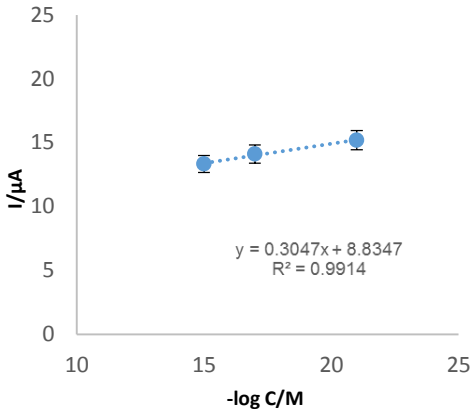


Fig. S11. *Intraday stability of probe/Au NPs-Cys/Ag NPr/GQDs nano ink/paper electrode.* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E= 0.2 V, duration time= 150 s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*


A
I/μA
t/s
cDNA 10^-15+plasma
cDNA 10^-19+plasma
cDNA 10^-21+plasma
0
5
10
15
20
25
0
50
100
150


I/μA
-log C/M
y = 0.3047x + 8.8347
R² = 0.9914
0
5
10
15
20
25
10
15
20
25

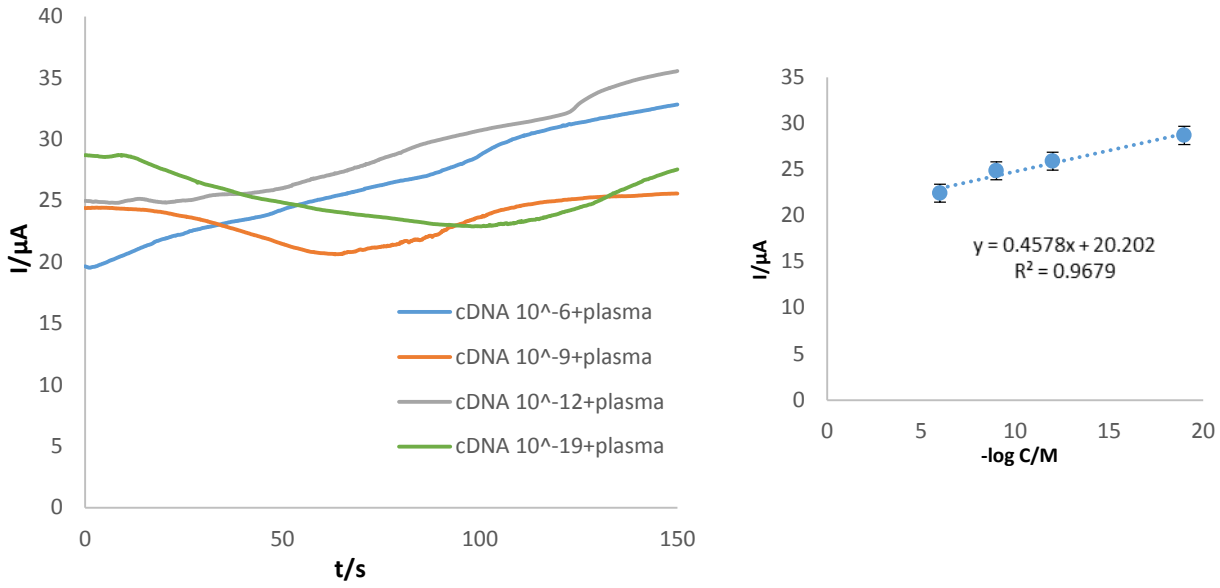


Fig. S12. *ChAs of the proposed DNA-based biosensor in the mixture of plasma and target sequence and calibration plots* ***A)*** *Photographic paper and* ***B)*** *Ivory sheet (E=0.2 V, duration time= 150s, supporting electrolyte is* $[Fe(CN)_6]^{3-/4-}$*/KCl).*