

Gold nanoparticles decorated graphene sheet-polypyrrole based nanocomposite: Synthesis, characterization and genosensing application

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SUPPLEMENTARY INFORMATION

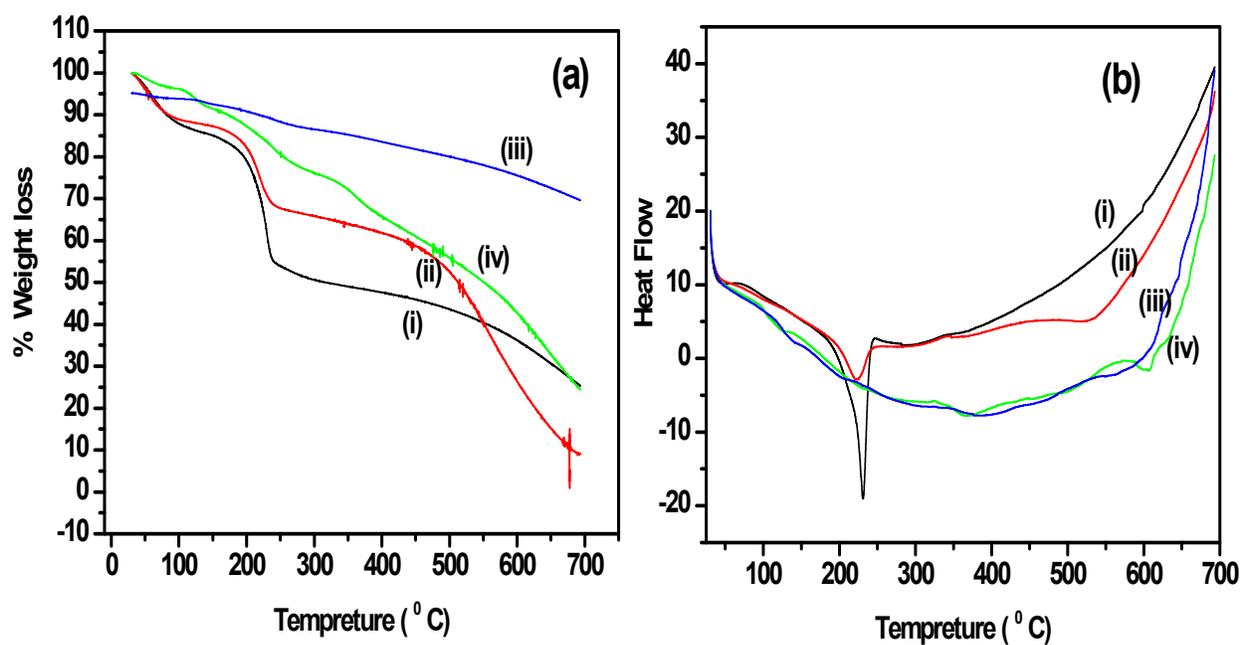


Figure S1. (a) TGA and (b) DTA analysis of the GO film (curve (i)), GO-GNPs (curve (ii)), PPY (curve (iii)) and the GO-GNPs/PPY (curve (iv)) hybrid nanocomposite.

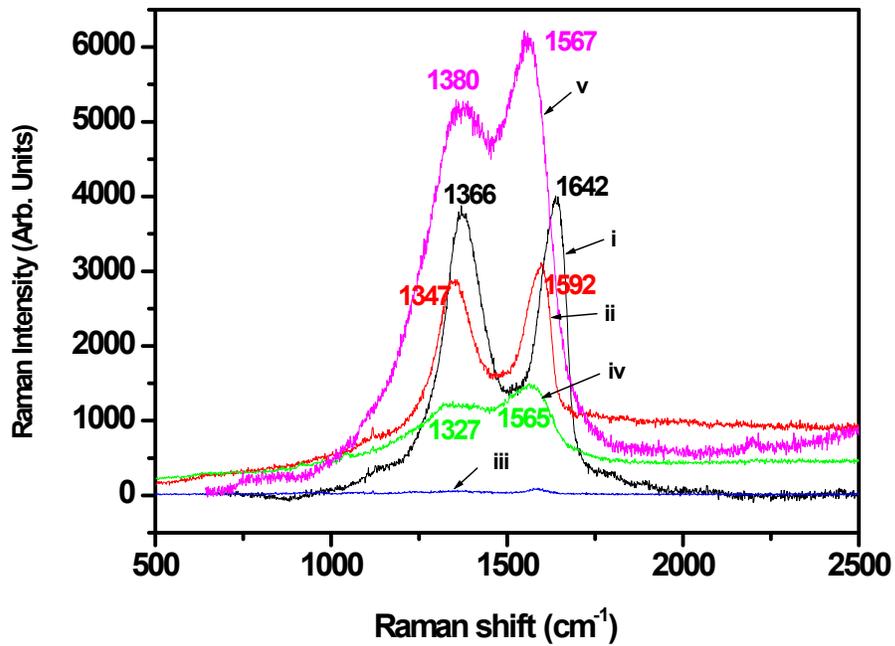


Figure S2. Raman spectra of (i) GO, (ii) GO-GNPs, (iii) GNPs, (iv) PPY and (v) GO-GNPs/PPY nanocomposite.

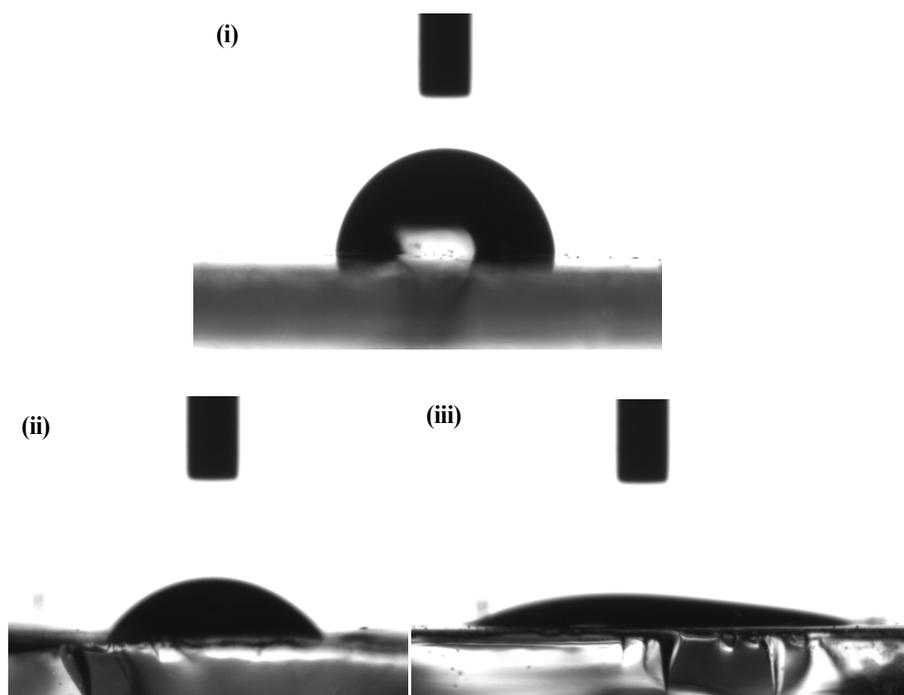


Figure S3. Contact angle images of (i) ITO electrode and (ii) GO-GNPs/PPY/ITO electrode and (iii) pDNA/GO-GNPs/PPY/ITO electrode.

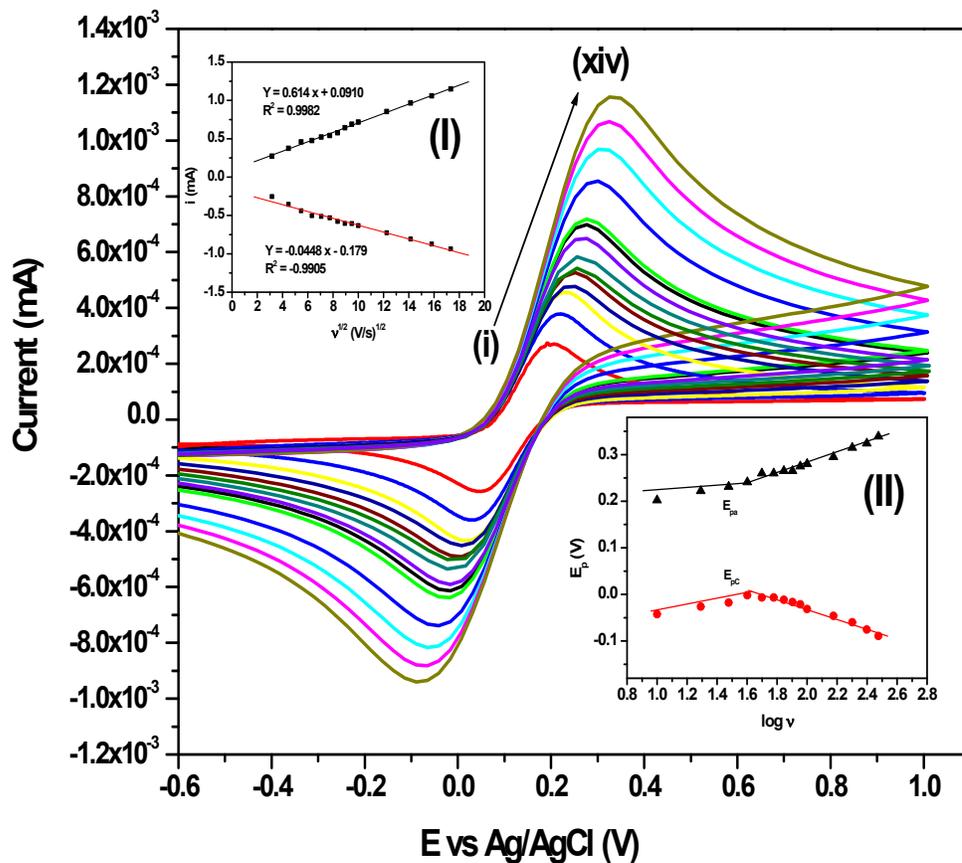


Figure S4. Cyclic voltammogram of GO-GNPs/PPY/ITO electrode as a function of scan rate (10,20,30,40,50,60,70,80,90,100,150,200,250,300 mV/s; curves i-xiv). Inset I: The peak currents (I_{pa} and I_{pc}) vs. square root of sweep rate. Inset II: The peak potential (E_a and E_c) vs. the scan rate

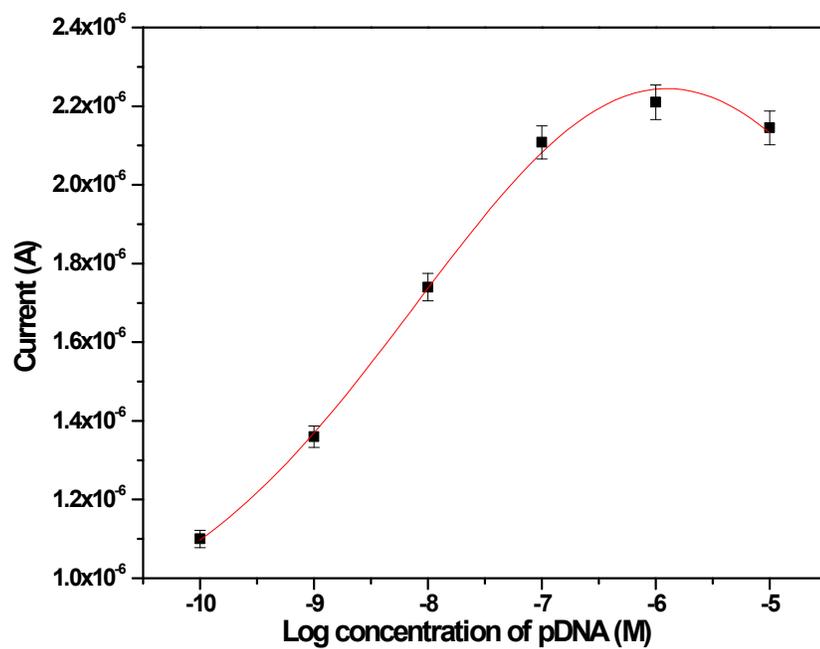


Figure S5. Change in peak current with variation in pDNA concentration (10^{-5} to 10^{-10} M)

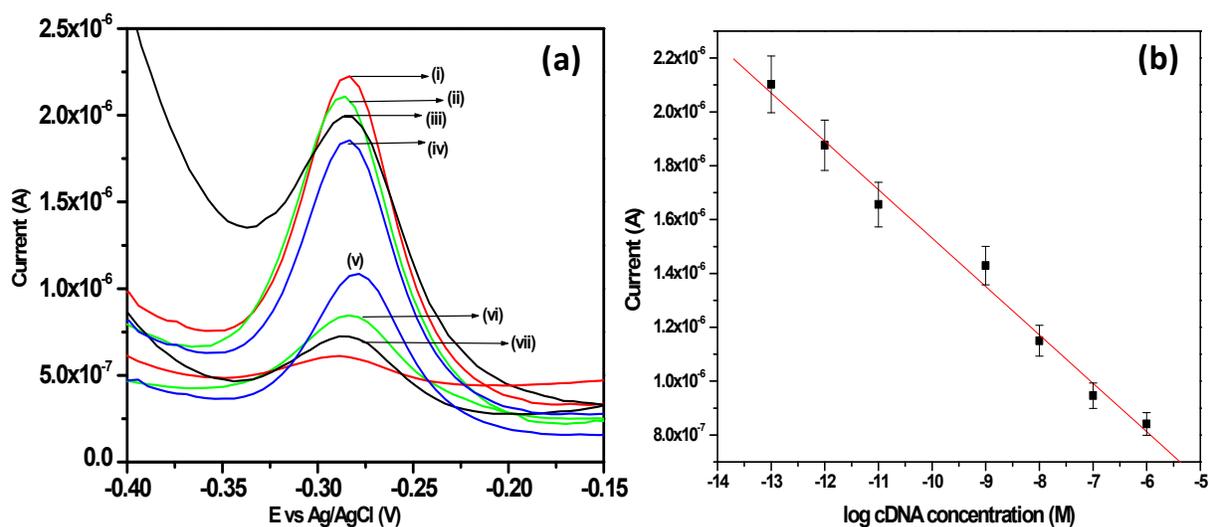


Figure S6. (a) Differential pulse voltammetric studies after immobilization of pDNA on (i) GO-GNPs/PPY/ITO, (ii) GO/PPY/ITO, (iii) GNPs/PPY/ITO, (iv) PPY/ITO and after hybridization on (v) pDNA/PPY/ITO (vi) pDNA/GNPs/PPY/ITO (vii) pDNA/GO/PPY/ITO (viii) pDNA/GO-GNPs/PPY/ITO, bioelectrode using methylene blue (MB, $20 \mu\text{M}$) as redox hybridization indicator. (b) Calibration plot for the peak current of MB reduction vs logarithm of concentration of target DNA for pDNA/GO/PPY/ITO bioelectrode.

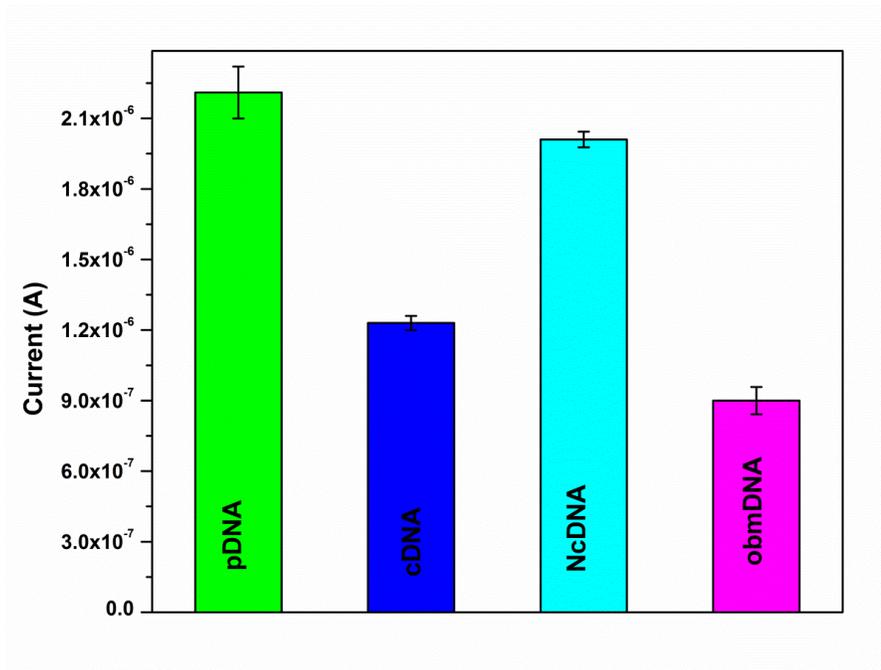


Figure S7. Bar diagram showing the DPV response (in terms of peak current) of pDNA/ GO-GNPs/PPY/ITO bioelectrode incubated with complementary, non-complementary, single-base mismatch.

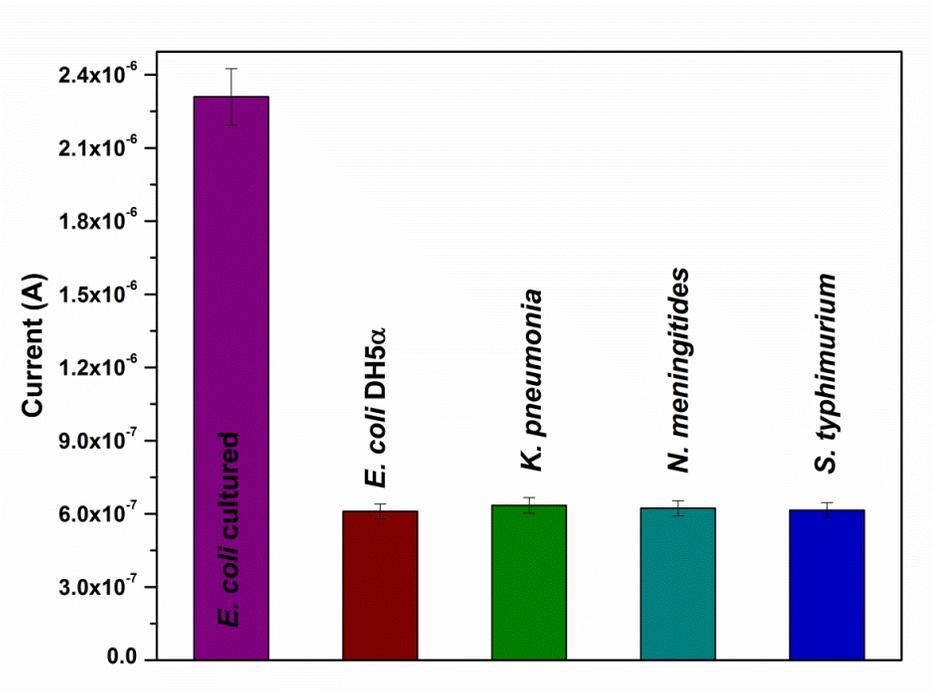


Figure S8. Bar diagram showing the DPV response of pDNA/GO-GNPs/PPY/ITO bioelectrode incubated and DNA extracted from culture of other pathogens.

Table ST1. Table showing the electrochemical response of the fabricated genosensor compared to other literature for *E. coli* detection

| Serial No. | Immobilization Matrix | Method of immobilization | Technique | Detection Range (M) | Limit of Detection(M) | Response Time | References |
|------------|--|--------------------------|--|---|---|---------------|------------|
| 1. | Q-PCR amplified <i>E.coli</i> biosensor based on avidin biocomposite (Av-GEB) and magneto bead(m-GEC) modified electrode | Self assembly | Electrochemical amperometric technique using enzyme marker HRP | - | 4.5×10^{-15} (Av-GEC) and 0.45×10^{-15} (m-GEC) | - | [45] |
| 2. | Streptavidin conjugated Fe_3O_4 nanoparticles | Self assembly | Quartz crystal microbalance (QCM) | 2.67×10^2 to 2.67×10^6 cfu/ml | 2.67×10^2 cfu/mL | - | [46] |
| 3. | aMB E-sensor | - | Differential pulse voltammetry (DPV) | 1×10^{-12} to 1×10^{-9} | - | 5 min | [47] |
| 4. | 2-mercaptobenzothiazole (MBT)/Au electrode | Self assembly | DPV | 1.59×10^{-8} to 2.4×10^{-6} | 2.38×10^{-9} | 50 min | [48] |
| 5. | Au_{nano} -CNT/ PAN_{nano} /CPE | Self assembly | Impedance (EIS) | 1.0×10^{-12} to 1.0×10^{-6} | 5.6×10^{-13} | | [49] |
| 6. | Streptavidin alkaline phosphatase (ST-AP) electrode | Covalently | DPV | 1×10^{-12} to 10×10^{-9} | 3×10^{-13} | - | [50] |
| 7. | 3,3'-dithio dipropionic acid di(<i>N</i> -succinimidyl ester) and mercaptohexanol /Au | Covalently | | 3.1 – 50 ng | | - | [51] |
| 8. | Microbially-modified glassy carbon electrode | Entrapment | Amperometry | 0.2 ng to 2 μ g ml^{-1} | 2 cfu/100 | 20 min | [52] |

| | | | | mL | | | |
|----|---------------------------|---------------|-----|---|---------------------|--------|--------------|
| 9. | GO-GNPs/PPY/ITO electrode | Self assembly | DPV | 0.5×10^{-16} to 1×10^{-8} | 1×10^{-15} | 30 min | Present work |