Supplementary Information

Label-Free and Ultrasensitive Electrochemical DNA Biosensor Based on Urchin-like Carbon Nanotube-Gold Nanoparticle Nanoclusters

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Name	Sequence
Probe DNA (P-DNA)	NH2-(CH ₂) ₆ -TATAACGACCGCAGA
Reporter DNA (R-DNA)	CTCTTCCTATGTGCTCGTCAGGTCTATCCATTTT-SH
DNA-1 linked with CNTs	AAAAAA AAAACGTCGTCGTC-(CH ₂) ₆ -NH2
Linker DNA (L-DNA)	TTTTTTTTTTTTT-SH
Target DNA (T-DNA)	AGCACATAGGAAGAGTCTGCGGTCGTTATA
Single-base-mismatched	AGCACATAGGAAGAGACTGCGGTCGTTATA
Two-base-mismatched	AGCACATAGGAAGAGACTGCCGTCGTTATA
Non-complementary	TAGCTCATCTGATACTTCTATGCTGATATT

Table S1: DNA sequences used in biosensor



Figure S1. Histogram of the length distribution of DNA-wrapped CNTs.



Figure S2. The statistic distribution of the number of CNTs attached on the surface of AuNP, and a representative AFM image.



Figure S3. Comparison of the resistance R_{ct} value of DNA biosensor before and after addition of CNTs without covalently linked DNA. A) Schematic drawing of the control experiment by using CNTs for DNA detection. B) There is no obvious difference in the resistance R_{ct} value, before and after the addition of CNTs, indicating that the decrease in R_{ct} was caused by the attachment of DNA modified CNTs on the AuNP surface, and the formation of urchin-like 3D nanoclusters.



Figure S4. LSV responses of the AuNP-assisted DNA biosensor. After the hybridization of target DNA, the electrode was immersed in the dual-DNA functionalized AuNP solution following with DI washing. Finally, LSV measurements were carried out in a 5.0 mM $[Fe(CN)_6]^{4-/3-}$ solution containing 0.10 M KCl in a scan ranging from -0.2 V to +0.6 V.



Figure S5. Linear relationship of current response vs target DNA concentration measured by DNA biosensor without CNT involvement (n=3). The detection limit is 130 fM.



Figure S6. The stability test of the proposed DNA biosensor. The left column was the initial result and the right column was the result from an electrode which has been stored in PBS buffer for 5 days at 4 °C. The concentration of target DNA is 10 pM.