Supporting Information

Nitrogen and Sulfur Co-doped Reduced Graphene Oxide as a General Platform for Rapid and Sensitive Fluorescent Detection of Biological Species

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All oligonucleotides with different sequences were synthesized and purified with HPLC by Sangon Biotechnology Co., Ltd (Shanghai, China). The sequences of the oligonucleotides used in this work are as follows:

(1)5'-QDs -TTT AAA AAT ACC ACA TCA TCC ATA TA TTT AAA-3'(P_{HBV})

(2)5'-QDs -TAT GTG GAT GAT GTG GTA TT-3'(MT1HBV)

(3)5'-QDs -TAT GTG GCT GTT GTG GTA TT-3'(MT2HBV)

(4)5'-QDs -TAT GTG GCT GTT GTG GAA TT-3'(MT3HBV)

(5)5'-QDs -TTT AAA TGC ATC CAG GTC ATG TTA TTC CAA ATA TCT TCT TTT AAA-3'(P_{HIV})

(6)5'-QDs-AGA AGA TAT TTG GAA TTA CAT GAC CTG GAT GCA-3'(MT1HIV)

(7)5'-QDs-AGA AGA TAT TAG GAA TAA CAT GTC CTG GAT GCA-3'(MT2HIV)

(8)5'-QDs-AGA AGA TTT TTG GAA TTA CAT GAC CAG GAT GCA-3'(MT3HIV)

(9) The thrombin aptamer with a sequence of 5'-GGTTGGTGTGGTTGG-3'

(10) The IgE aptamer with a sequence of 5'-GGGG CACG TTTATCCG TCCC TCCT AGTG GCGT GCCCC-3'

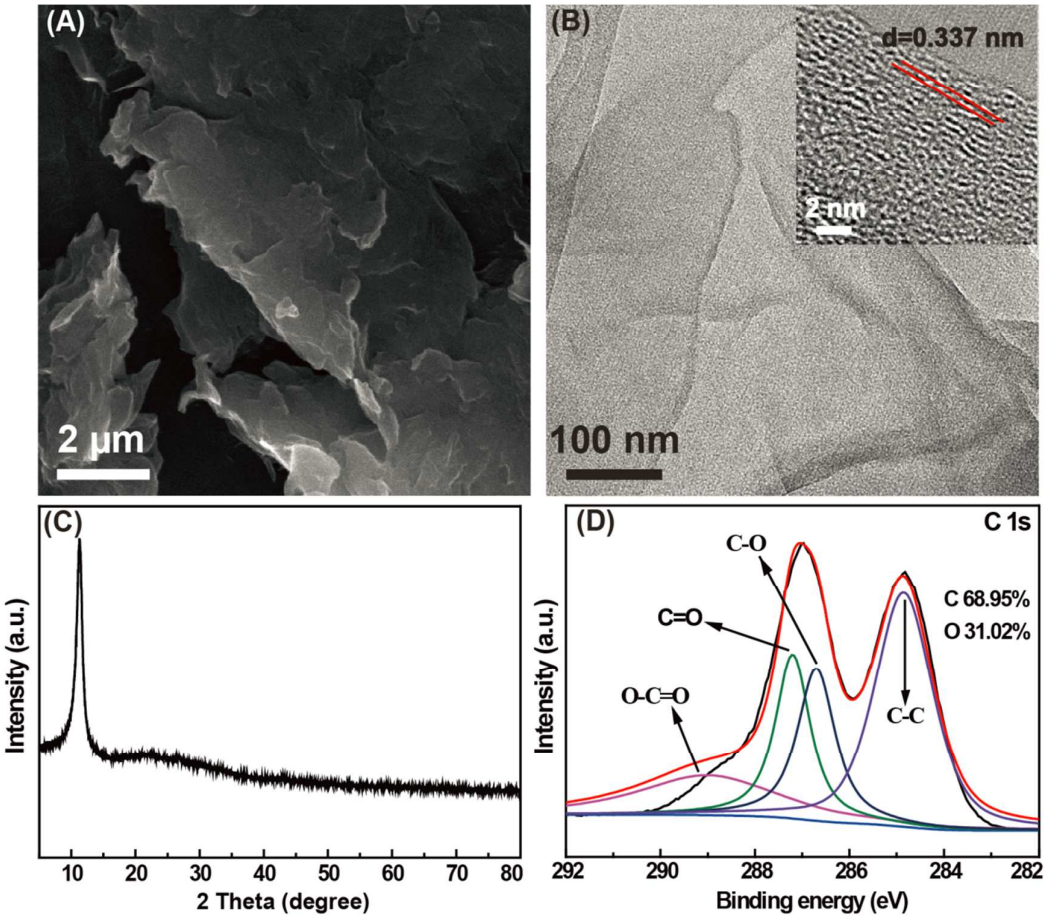

Figure S1. (A) SEM image of GO. (B) TEM image of GO and inset is its HRTEM image. (C) XRD pattern of GO. (D) High-resolution C1s XPS spectrum of GO.

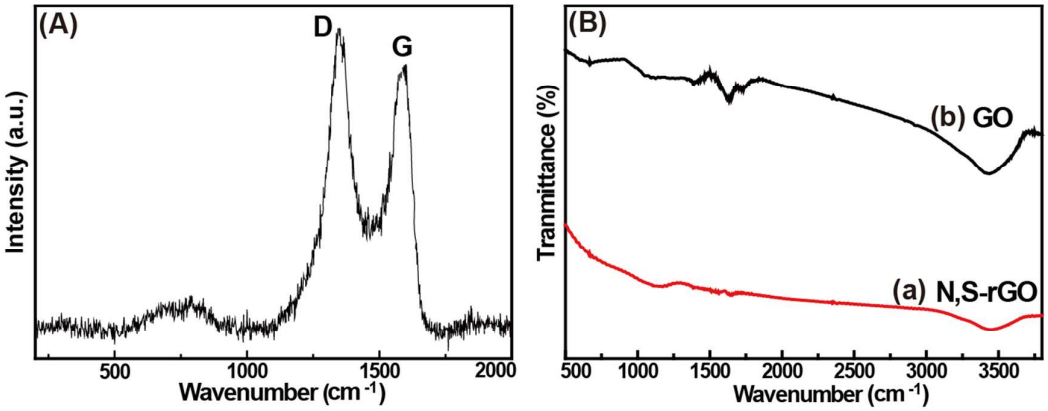

Figure S2. (A) Raman spectrum of N,S-rGO. (B) FT-IR spectrum of (a) N,S-rGO and (b) as-prepared GO.

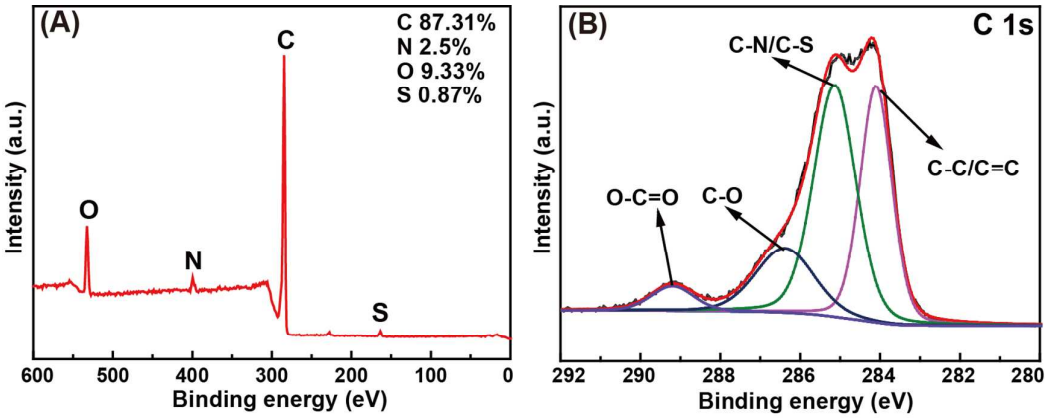

Figure S3. (A) XPS full survey and (B) High-resolution C1s XPS spectrum of N,S-rGO.

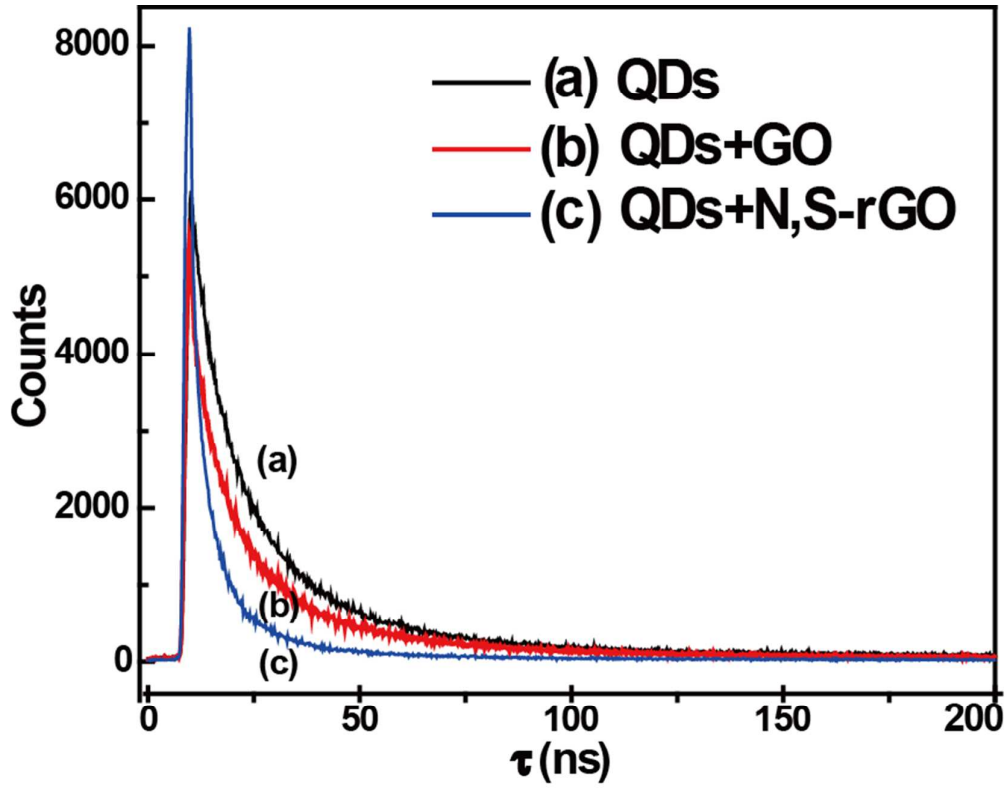

Figure S4. PL decay curves: (a) 525 nm QDs; (b) 525 nm QDs and GO; (c) 525 nm QDs and N,S-rGO. All solutions were prepared in PBS buffer (10 mM, pH 8.0), λ_{ex}=388 nm; λ_{em}=525 nm.

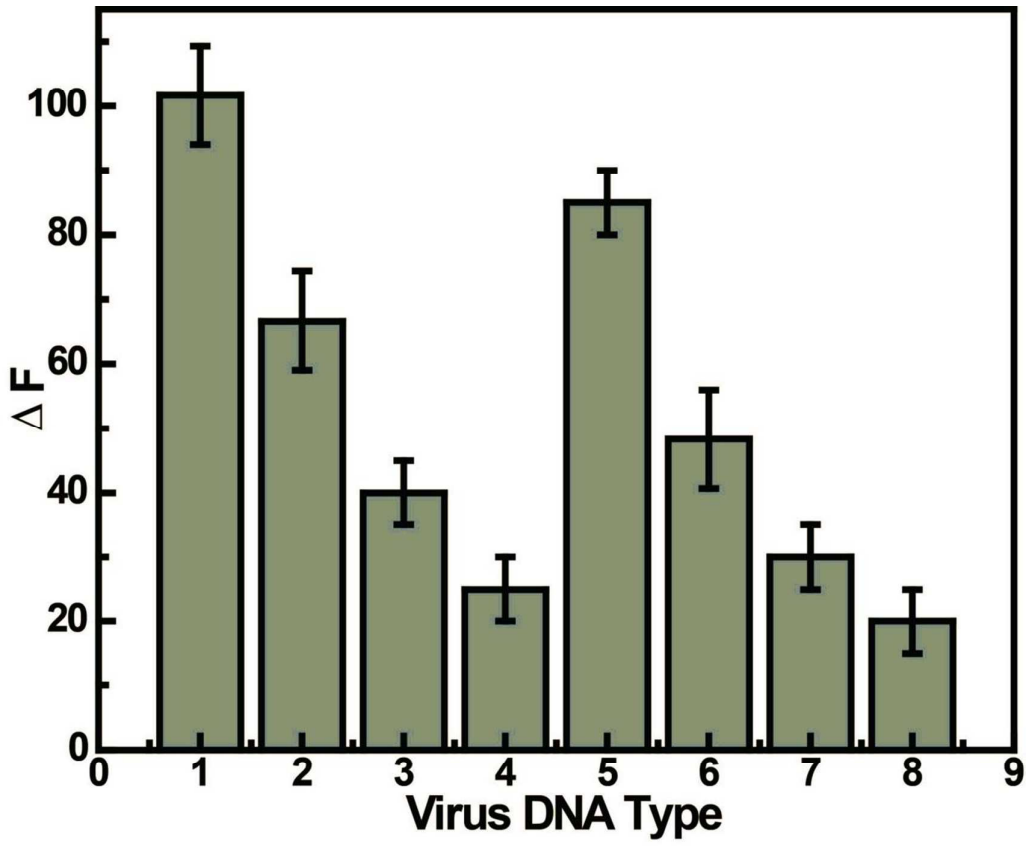

Figure S5. Fluorescence recovered intensity of target HBV DNA (1), single mismatched HBV DNA (2), double mismatched HBV DNA (3), three mismatched HBV DNA (4), fluorescence recovered intensity of target HIV DNA (5), single mismatched HBV DNA (6), double mismatched HBV DNA (7), three mismatched HBV DNA (8).

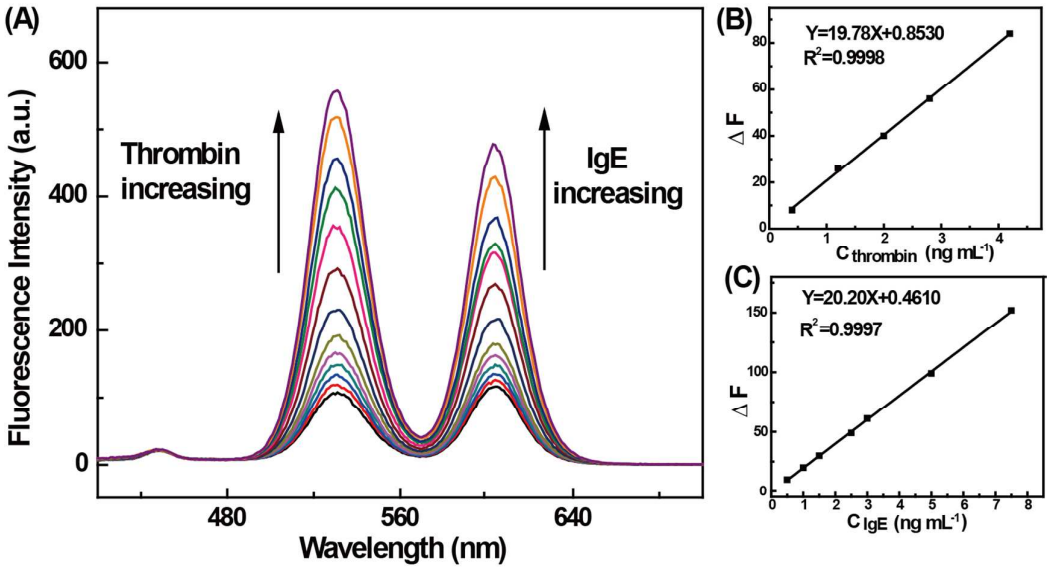

Figure S6. (A) Fluorescence spectra of QDs-P and N,S-rGO; the concentrations of thrombin are 0.4, 1.2, 2.0, 2.8, 4.2 ng mL^{-1} and that of IgE are 0.5, 1.0, 1.5, 2.5, 3.0, 5.0, 7.5 ng mL^{-1} (from bottom curve to top curve). (B) Linear curve for thrombin detection. (C) Linear curve for IgE detection.

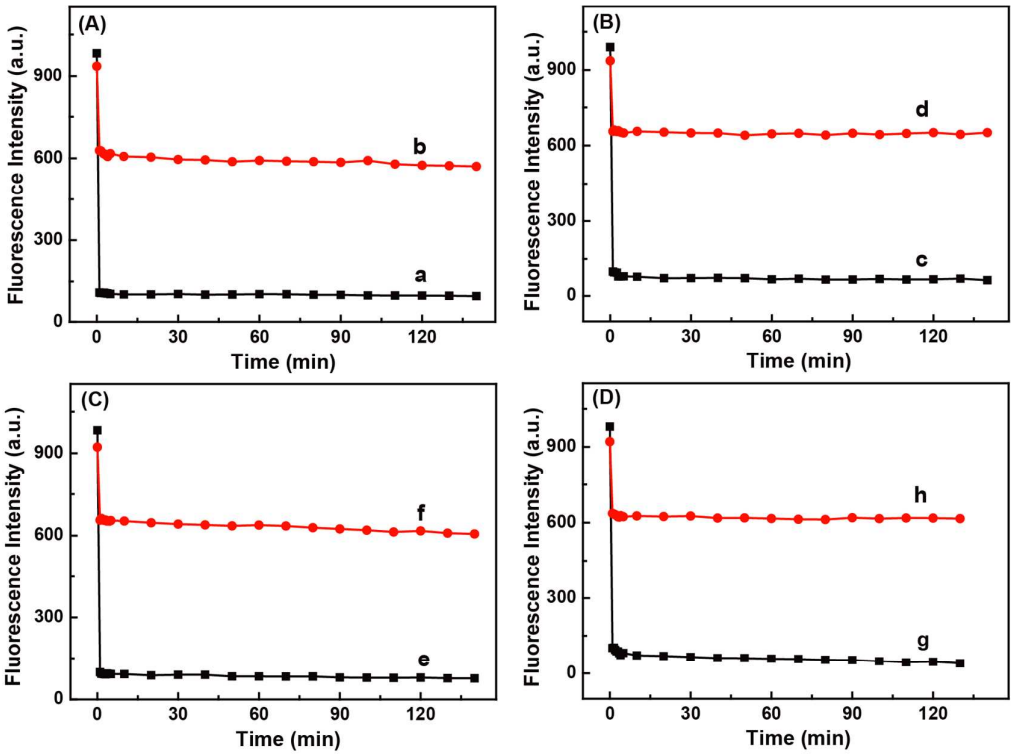

Figure S7. Fluorescence quenching kinetic curves of CdSe QDs by N,S-rGO. (A) Fluorescence quenching kinetic curves of QDs-P1 mixing with N,S-rGO before (curve a) and after incubated with HBV DNA (curve b) in PBS solution. (B) Fluorescence quenching kinetic curves of QDs-P1 mixing with N,S-rGO before (curve c) and after incubated with HBV DNA in 1% human serum samples (curve d). (C) Fluorescence quenching kinetic curves of QDs-P2 mixing with N,S-rGO before (curve e) and after incubated with HIV DNA (curve f) in PBS solution. (D) Fluorescence quenching kinetic curves of QDs-P2 mixing with N,S-rGO before (curve g) and after incubated with HIV DNA in 1% human serum samples (curve h). The excitation and emission slits were 10 nm and 15nm, respectively.