Electronic Supporting Information for the Article:

Nucleic acid detection using single-walled carbon nanohorns as fluorescent sensing platform

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Experimetal Section

Professor S. Iijima generously offered dahlia-like SWCNHs that were prepared at room temperature by CO_2 laser ablation. SWCNTs were purchased from Shenzhen Nanotech Port Co. Ltd. (China). GO was synthesized from graphite powder based on the Hummer's method.[1] All chemically synthesized oligonucleotides were purchased from Shanghai Sangon Biotechnology Co. Ltd. (Shanghai, China). DNA concentration was estimated by measuring the absorbance at 260 nm. All the other chemicals were purchased from Aladin Ltd. (Shanghai, China) and used as received without further purification. Double distilled water was used throughout the experiments.

Scanning electron microscopy (SEM) images were taken using a PEI XL30 ESEM PEG scanning electron microscopy. Transmission electron microscopy (TEM) measurements were performed on a JEOL 2010 transmission electron microscope operated at an accelerating voltage of 200 KV. Fluorescent emission spectra were recorded on a Perkin Elmer LS55 Luminescence Spectrometer (Perkin Elmer Instruments. U.K.). Zeta potential measurements were performed on a Zetasizer Nano-ZS 90 (Malver Instruments Ltd., U.K.).

In a typical DNA assay, the fluorescent probe P_{HIV} (50 nM) was hybridized with the

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target in 20 mM Tris-HCl buffer (pH 7.42, containing 100 mM NaCl, 5 mM KCl and 5 mM Mg^{2+}) for 10 min. 2 mg SWCNHs were first sonicated in DMF for 1 h to give a homogeneous black solution which can be diluted with Tris-HCl buffer to make SWCNHs suspension easily. An aliquot of the freshly made SWCNHs suspension was added to a Tris-HCl buffer containing P_{HIV} or P_{HIV}-T_1 complex. After 2 min incubation, fluorescence measurements were performed.

Oligonucleotide Sequences are listed as follows:

P_{HIV} (FAM dye-labeled ssDNA):

5′-FAM-AGT CAG TGT GGA AAA TCT CTA GC-3′

T_1 (complementary target):

5′-GCT AGA GAT TTT CCA CAC TGA CT-3′

T_2 (single-base mismatched target):

5′-GCT AGA GAT T<u>G</u>T CCA CAC TGA CT-3′ (mismatch underlined).

T_3 (non-complementary target):

5′-TTT TTT TTT TTT TTT TTT TTT TT-3′

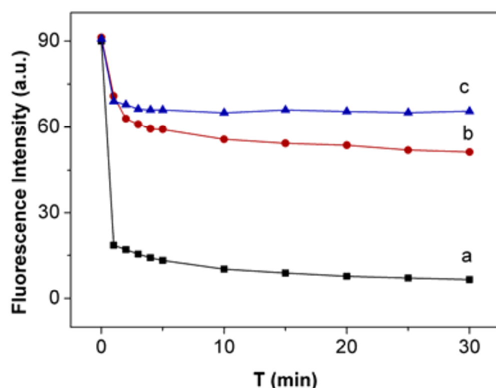

Fig.S1 Fluorescence quenching of P_{HIV} (50 nM) as a function of incubation time upon addition of SWCNHs (a), SWCNTs (b) and GO (c), respectively. Excitation was at 480 nm, and the emission was monitored at 522 nm. All experiments were done in Tris-HCl buffer in the presence of 5 mM Mg^{2+} (pH: 7.42). All the concentrations of SWCNHs, SWCNTs and GO were 5μg/mL.

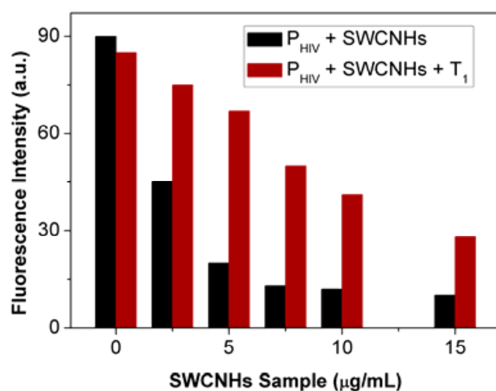

Fig.S2 Fluorescence intensity histogram of P_{HIV} + SWCNHs and P_{HIV} + T_1 + SWCNHs in the presence of 0, 2.5, 5, 7.5, 10, and 15 μg/mL SWCNHs. ([P_{HIV}] = 50 nM; [T_1] = 200 nM). Excitation was at 480 nm, and the emission was monitored at 522 nm. All measurements were performed in Tris-HCl buffer in the presence of 5 mM Mg^{2+} (pH: 7.42).

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Optimization of the Variables of the Measuring System

Effect of pH of solution on the fluorescence responses

The fluorescence intensity of FAM is weak when pH is less than 6.5. The fluorescence intensity of both P_{HIV}-T_1-SWCNHs and P_{HIV}-SWCNHs increases with increasing pH in the range of 6.5-9.0. Fig.S3 depicts the relationship between the fluorescence intensity ratio and pH from 6.5 to 9.0. The fluorescence intensity ratio of the system, F/F_0, increases with pH when pH is less than 7.4 and then decreases at pH higher than 8.0, where F_0 and F are the fluorescence intensity of the P_{HIV}-SWCNHs and P_{HIV}-T_1-SWCNHs, respectively. The maximum fluorescence intensity ratio is obtained at pH 7.4.

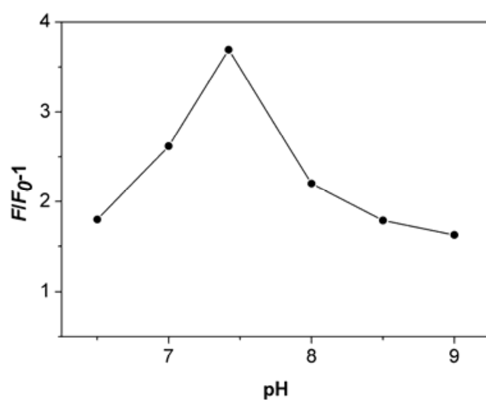

Fig.S3 Fluorescence intensity ratio of P_{HIV}-SWCNHs as a function of pH, where F_0 and F are the fluorescence intensity of P_{HIV}-SWCNHs in the absence and presence of 200 nM T_1, respectively.

Effect of concentration of NaCl on the fluorescence responses

The effect of ionic strength of the solution on the fluorescence intensity ratio was also investigated by altering the concentration of NaCl. Fig.S4 indicates the relationship between the fluorescence intensity ratio and the concentration of NaCl. The fluorescence intensity ratio slightly increases with the increase in concentration of NaCl at lower concentration (less than 100 mM) and then decreases gradually with the increase in concentration of NaCl when the concentration of NaCl is higher than 100 mM. Therefore, a concentration of 100 mM was selected.

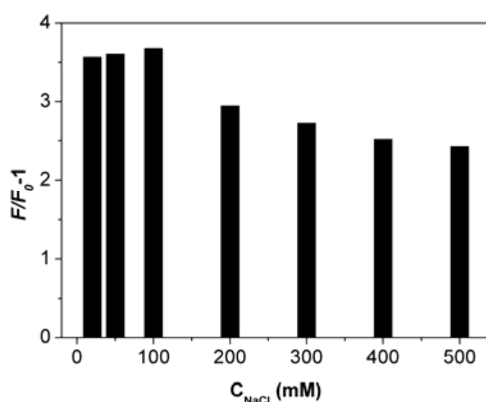

Fig.S4 Fluorescence intensity ratio of P_{HIV}-SWCNHs plotted against the concentration of NaCl, where F_0 and F are the fluorescence intensity of P_{HIV}-SWCNHs in the absence and presence of 200 nM T_1, respectively.

Reference

1. W. Hummers and J. R. Offeman, *J. Am. Chem. Soc.*, 1958, **80**, 1339.