Electronic Supplementary Information

Nano-graphite-DNA hybrid sensor for magnified fluorescent detection of mercury(II) ion in aqueous solutions

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Experimental

Materials.

The chemically synthesized oligonucleotide was purchased from Shanghai Sangon Biotechnology Co. Ltd. (Shanghai，China). Oligonucleotide sequence is listed as follows: 5′-TTC TTT CTT CCC CTT GTT TGT T-FAM-3′. The OND is rich in thymines (T) and readily forms a hairpin structure in the T-Hg^{2+}-T configuration in the presence of target Hg^{2+} ion. We reason that this Hg^{2+} specific oligonucleotide probe can be coupled with the ability of nano-graphite to specifically adsorb and quench the fluorescently labeled ssDNA to develop a novel fluorescent sensing platform for Hg^{2+} detection. OND concentration was estimated by measuring the absorbance at 260 nm. The nano-graphite (5-15 nm) was purchased from Nanjing XFNANO Materials Tech Co. Ltd. (Nanjing，China). All the other chemicals were purchased from Aladin Ltd. (Shanghai, China) and used as received without further purification. The water used throughout all experiments was purified through a Millipore system.

Fluorescent DNA Assays.

The working solution containing the FAM-labeled OND was obtained by dilution of the stock solution to a concentration of 50 nM using 20 mM Tris-HCl buffer containing 100 mM NaCl and 2 mM $MgCl_2$ (pH:7.5). An aliquot of the nano-graphite suspension (about 0.15 mg/mL) was added to the working solution. Then appropriate concentrations of Hg^{2+} and DNase I (25 U) were simultaneously added after 15 min, and the mixture was incubated for 2 hours at room temperature. Finally, the fluorescence intensity was measured. Fluorescent emission spectra were recorded on a PerkinElmer LS55 Luminescence Spectrometer (PerkinElmer Instruments, UK).

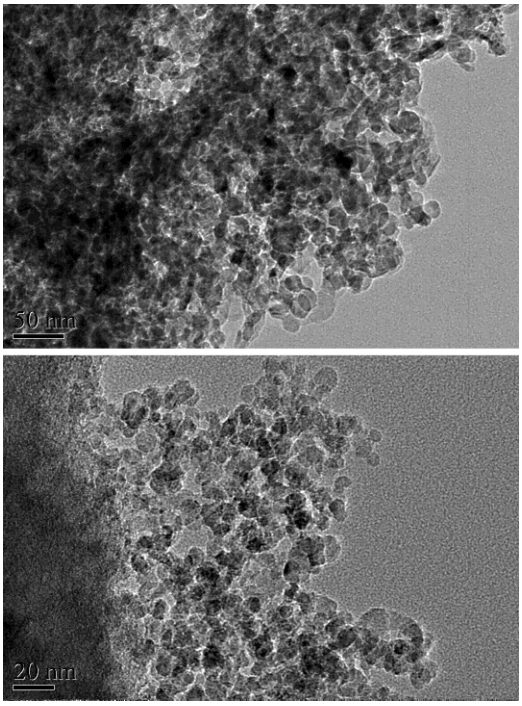

Fig. S1 TEM images of nano-graphite

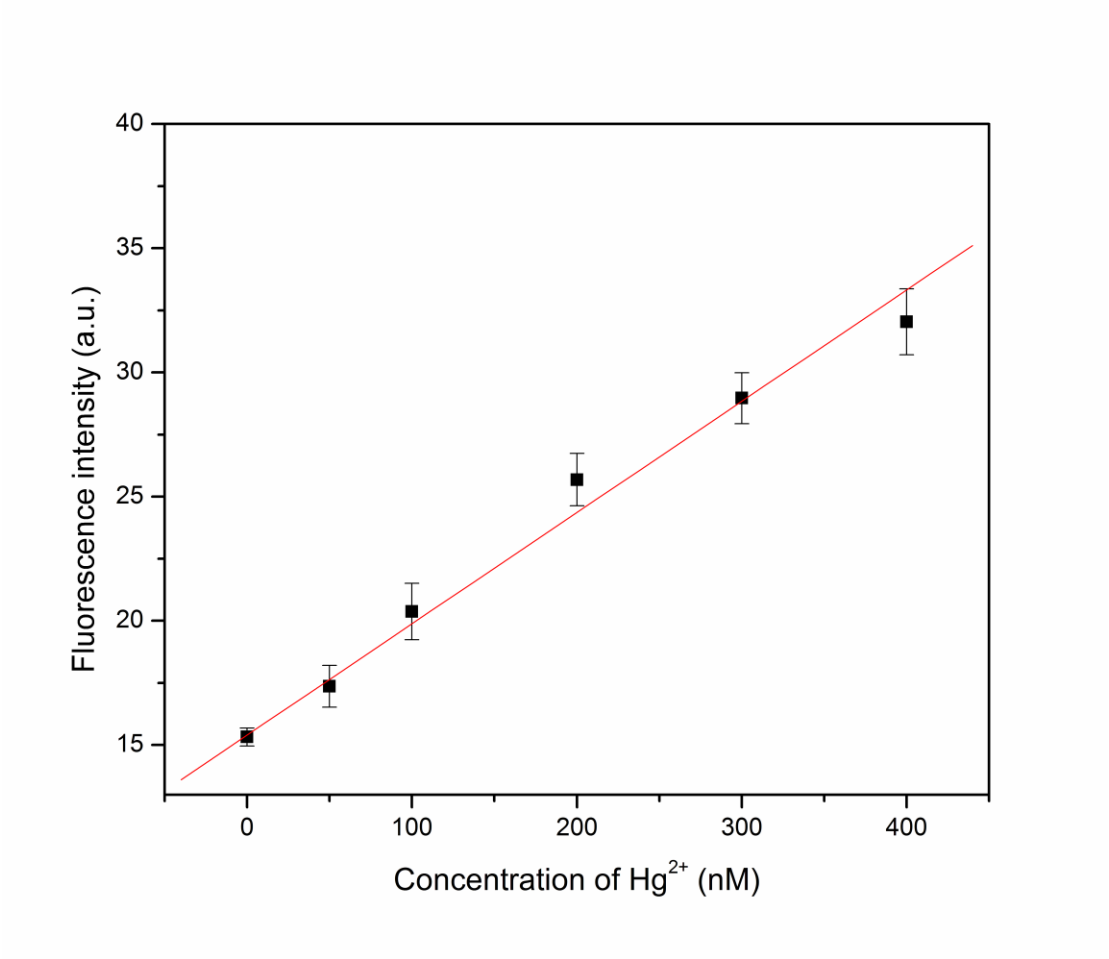

Fig. S2 Linear response of the fluorescence intensity of 50 nM ssDNA/NG upon the addition of Hg^{2+} at different concentrations (0, 50, 100, 200, 300, 400 nM) with error bars (standard deviation from the mean, n = 3). Excitation was at 480 nm and the emission intensity was monitored at 518 nm. All measurements were done in Tris-HCl buffer.

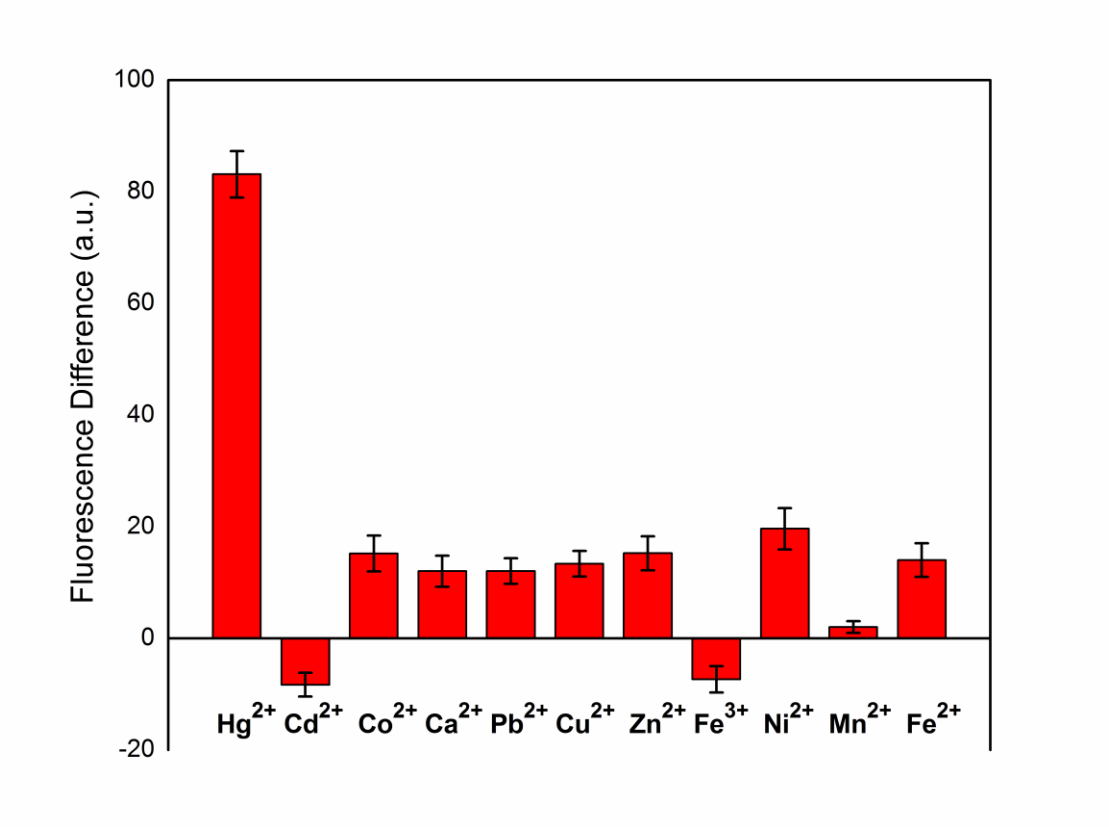

Fig. S3 Fluorescence difference with error bars (standard deviation from the mean, n = 3) of 50 nM ssDNA/NG between the blank and solutions containing 20 μM different ions. Excitation was at 480 nm and the emission intensity was monitored at 518 nm. All measurements were done in Tris-HCl buffer. Fluorescence difference = FL Intensity (ssDNA/NG + Metal ions) - FL Intensity(ssDNA/NG).

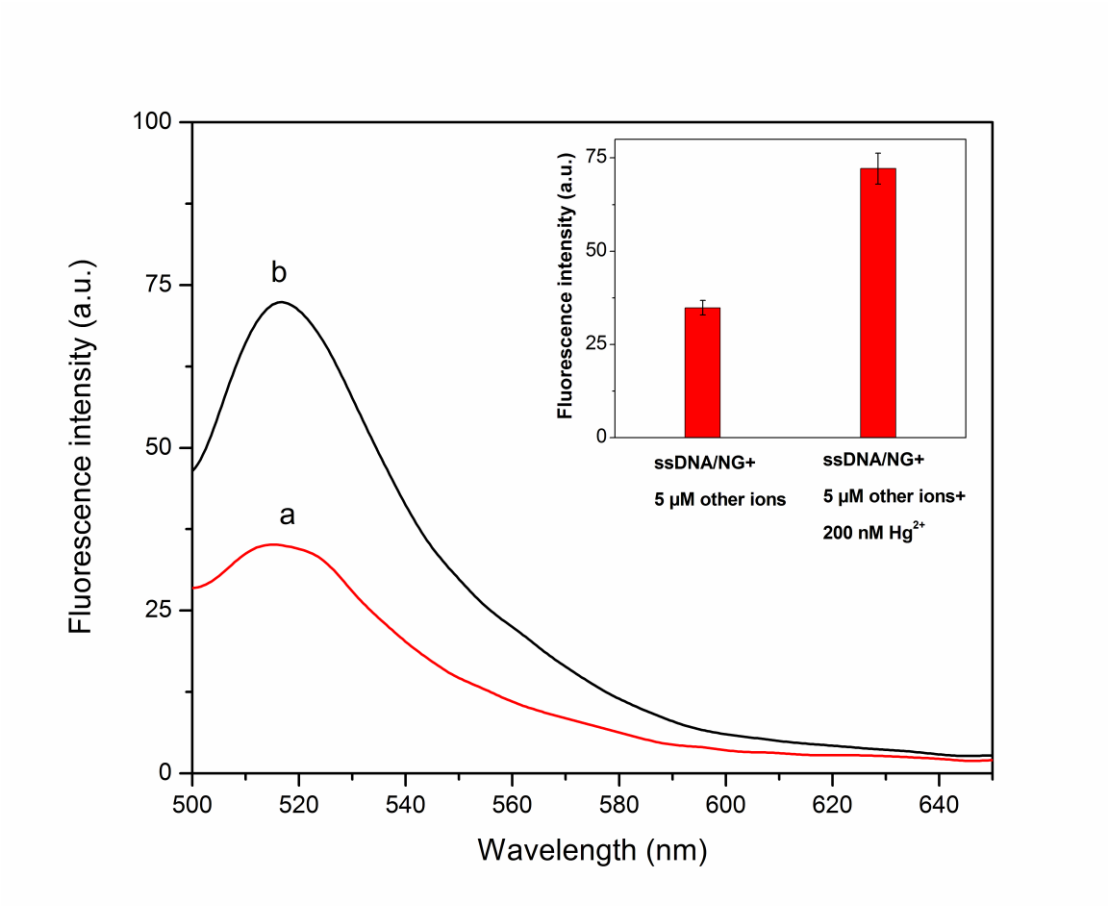

Fig. S4 Fluorescence spectra of (a) ssDNA/NG + 5 μM other metal ions; (b) ssDNA/NG + 5 μM other metal ions+ 200 nM Hg^{2+}. other metal ions: Cd^{2+}, Co^{2+}, Ca^{2+}, Pb^{2+}, Cu^{2+}, Zn^{2+}, Fe^{3+}, Ni^{2+}, Mn^{2+} and Fe^{2+}. The inset is the corresponding histograms with error bars (standard deviation from the mean, n = 3). Excitation was at 480 nm and the emission intensity was monitored at 518 nm. All measurements were done in Tris-HCl buffer.