Supporting Information

DNA Cleavage System of Nanosized Graphene Oxide Sheets and Copper Ions

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Physical methods:

Electronic absorption spectra of GO and DNA were recorded on a Cary 50 spectrophotometer (Varian, USA). IR spectra of GO was recorded on a Perkin-Nicolet FT-IR 200 in the range of 4000-400 cm^{-1}. Samples were run as KBr pellets. Atomic Force Microscopic images of graphene oxide were taken on a Nanoscope MultiMode V scanning probe microscopy (SPM) system (Veeco, USA). The scanning rate was set usually at 0.7-1 Hz. The samples for AFM were prepared by dropping aqueous suspension (～0.02 mg mL^{-1}) of the graphene oxide on freshly cleaved mica surface and dried under vacuum at 80 ℃. A JASCO J815 spectropolarimeter (Jasco International Co. Ltd., Japan) equipped with a Jasco temperature controller (model PTC-423S) and controlled by a PC was used for all circular dichrosim measurements at 22 ℃. A 1 mL quartz cell of 1 cm path length was used. Each spectrum was averaged from five successive accumulations at a scan rate of 50 nm/min. Fluorescence measurements were carried out with Hitachi f4600. Agarose gel electrophoresis was carried out with DYY-6C electrophoresis apparatus (Liuyi Instrumental Co., China). The agarose gels were visualized and digitized with FR-200A Gel Image Analysis System and analyzed by SmartView software.

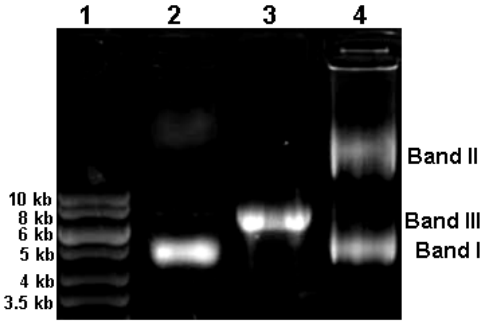

Figure S1. Agarose gel electrophoresis of the DNA ladder (lane 1), the DNA (0.75 μg/ml, lane 2), the DNA linearized by EcoRI (lane 3), and the DNA cleaved with GO/Cu^{2+} (GO, 75μg/ml and Cu^{2+}, 10 mM).

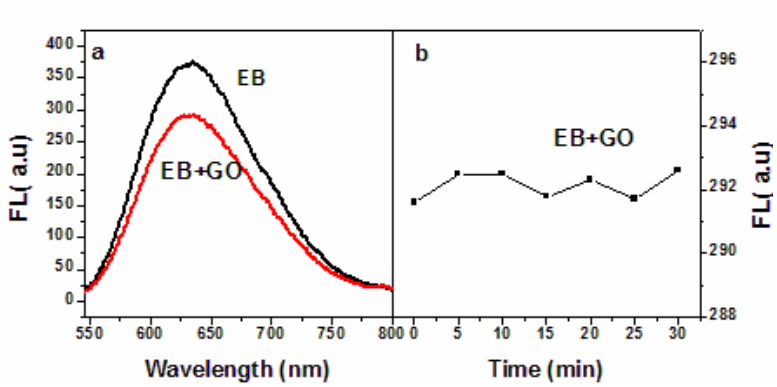

Figure S2. a) Effect of the GO on the FL intensity of EB alone (GO 10 μg/ml, EB 12 μg/ml), b) FL intensity variation of the EB with GO as function of time.

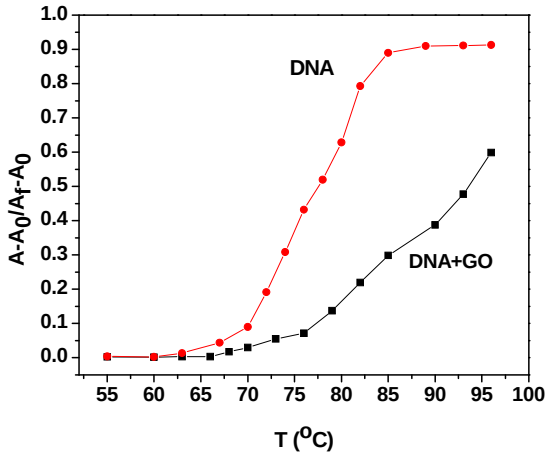

Figure S3. Thermal denaturation plots of DNA (10 μg/mL) at 260 nm in the absence and presence of the GO 3 μg/mL. Where A_0, A_f , and A are the absorption intensities at 50 °C, 97 °C , and at a given temperature between 50-97 °C, respectively. A_f for the sample of the DNA with GO was calculated as A_f(DNA) + (A_0(GO)- A_0(DNA)).

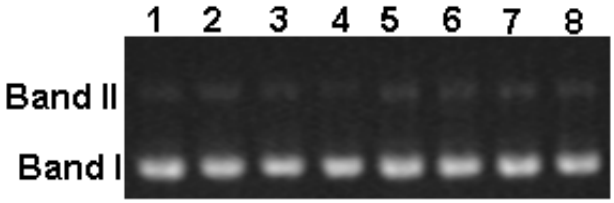

Figure S4. Agarose gel electrophoresis of the DNA (0.75 μg) treated with different amount of Cu^{2+}. Incubation time 2 hours (37 ℃). **Lane 1** is control, Cu^{2+} concentrations were **2**: 2.5，**3**: 7.5 , **4**: 10，**5**: 15，**6**: 20，**7**: 25, and **8**: 27.5 mM.

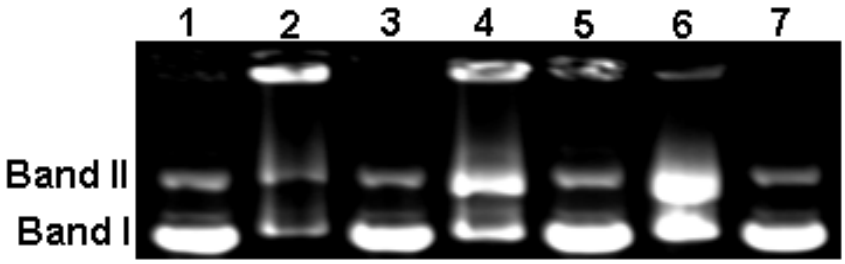

Figure S5. Comparison of the DNA cleavage activity of the GO/Cu^{2+} and GO alone in the buffer with the same ionic strength. DNA was 1.25 μg, incubation time 2 h (37 ℃). **Lane 1** control, **Lanes 2, 4**, and **6** were DNA with GO in the presence of 2.5, 10, and 22.5 mM Cu^{2+}, respectively. **Lanes 3, 5,** and **7** are DNA with GO in the presence of 5, 20, and 45 mM Na^{+}, respectively.

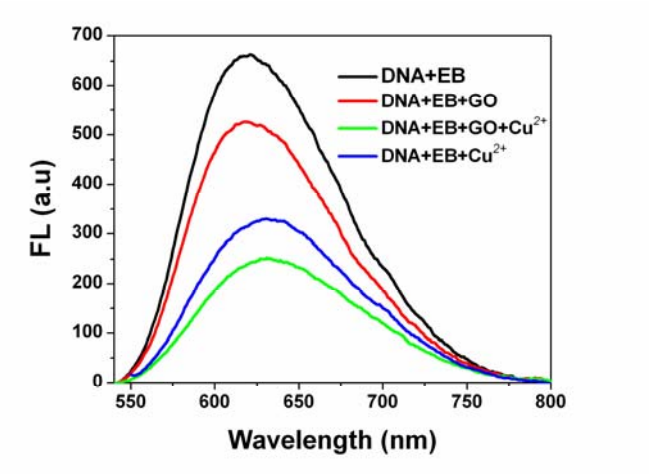

Figure S6. Effects of the GO, Cu^{2+}, and GO/Cu^{2+} on the FL spectra of DNA with EB (GO 10 μg/ml, EB 12 μg/ml, and Cu^{2+} 1 mM).

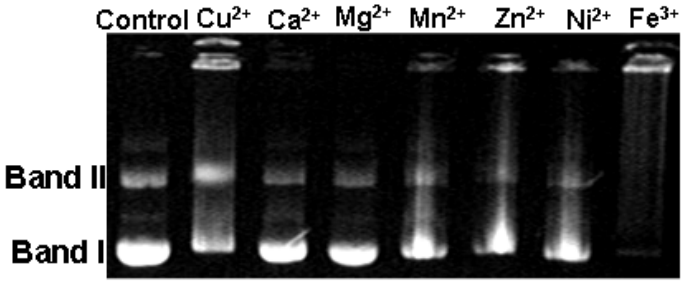

Figure S7. DNA cleavage activity of the GO with different metal ions incubated at 37 ℃ for 2 h. DNA was 1.2 μg, GO was 50 μg/mL, metal ions were all 10 mM except for Fe^{3+} (1 mM).

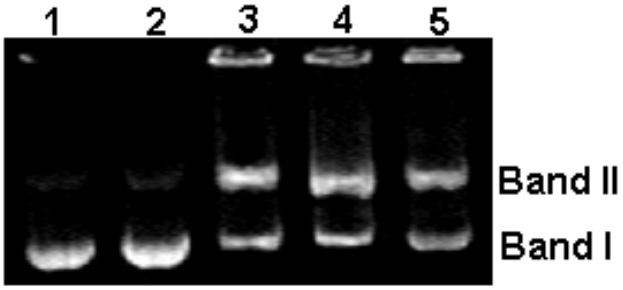

Figure S8. Agarose gel electrophoresis of the DNA (0.75 μg) treated with 125 μg/mL GO and 10 mM Cu^{2+} in the presence of DMSO (5%) and BuOH (5%). Incubation time was 2 hours (37 ℃). **Lane 1** is control, **Lane 2**: DNA+GO, **Lane 3**: DNA+GO+Cu^{2+}, **Lane 4**: DNA+GO+Cu^{2+}+DMSO, and **Lane 5**: DNA+GO+Cu^{2+}+BuOH.

Table S1. Cleavage of the DNA (1.25 μg) under constant Cu^{2+} concentration.

reagent (Cu^{2+}(10 mM)/GO μg/mL)	band I	band II	well
0	98	0	2
12.5	93	5	2
25	67	17	16
50	50	33	17
75	40	44	16
100	41	46	13
125	30	50	20