Electronic Supplementary Information

Multicolour fluorescent graphene oxide by cutting carbon nanotubes upon oxidation†

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1. Figure S1: FTIR spectroscopy of stepwisely oxidized products of P-MWCNTs

2. Figure S2: The TEM image of P-MWCNTs

3. Figure S3: Changes of fluorescence spectra of GONPs (12 + 96 h) at pH 1, 5, 7, 9, 11, and 14. The corresponding fluorescence images are shown.

4. Figure S4: The comparison of the influence of heavy metal ions on the fluorescence intensity.

5. Figure S5: Raman spectra of the samples.

6. The experimental details.

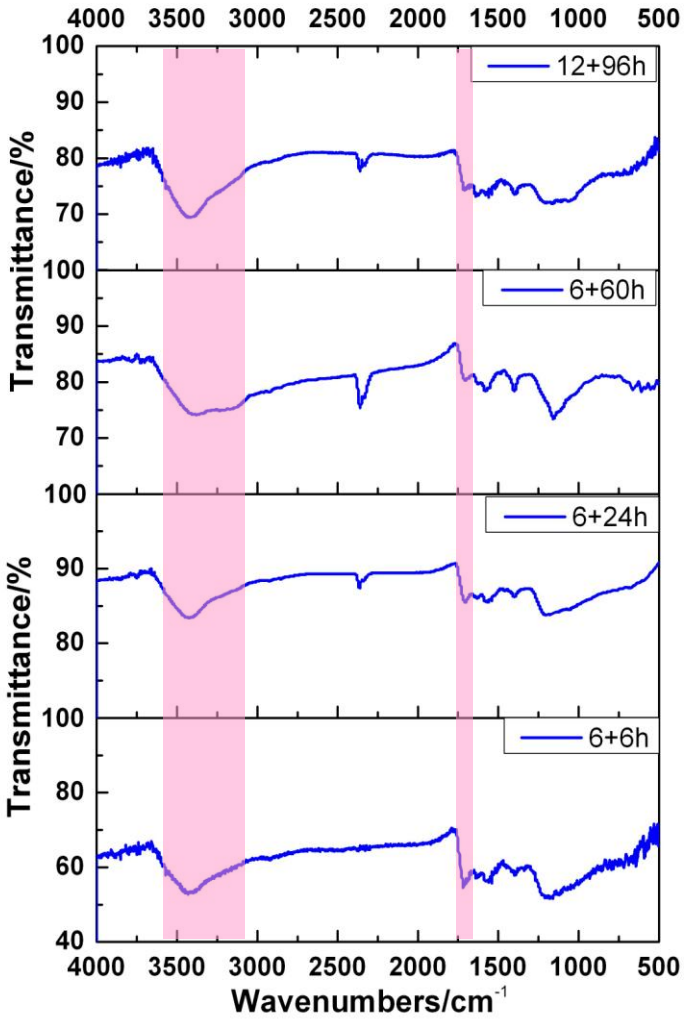

Figure S1: FTIR spectroscopy of stepwise oxidation of P-MWCNTs

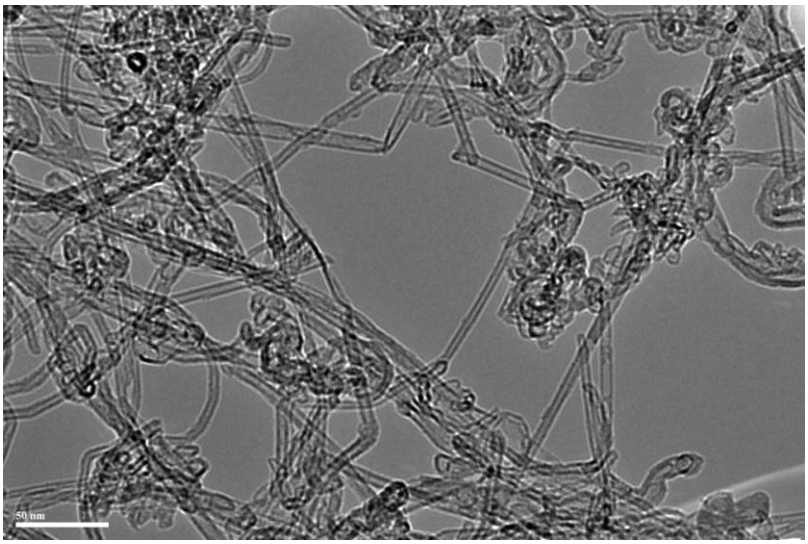

Figure S2: The TEM image of P-MWCNTs

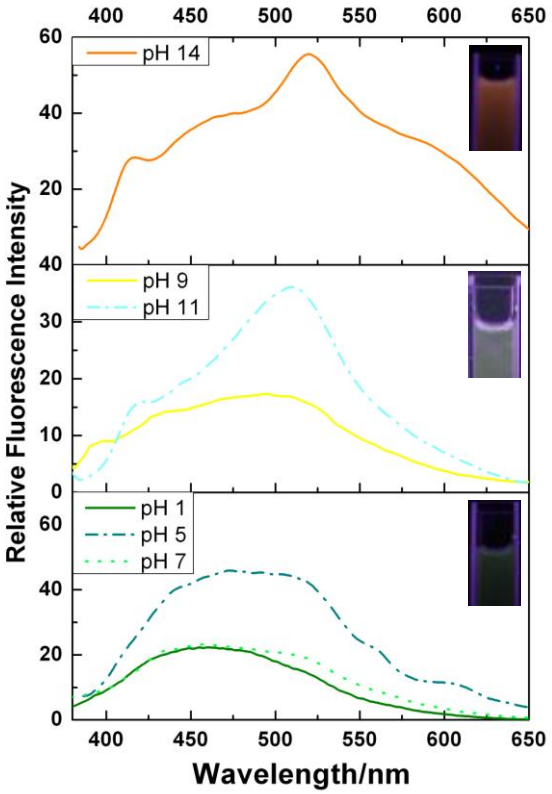

Figure S3: Changes of fluorescence spectra of GONPs (12 + 96 h) at pH 1, 5, 7, 9, 11, and 14. The corresponding fluorescence images are shown.

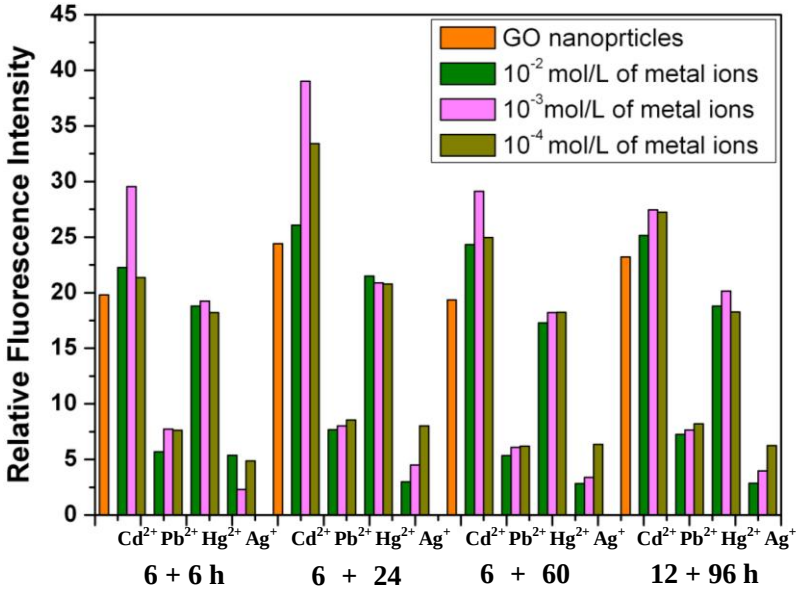

Figure S4: The comparison of the influence of heavy metal ions on the fluorescence intensity. All the dispersions were adjusted to pH 1 in order to eliminate the pH effect induced by metal ions.

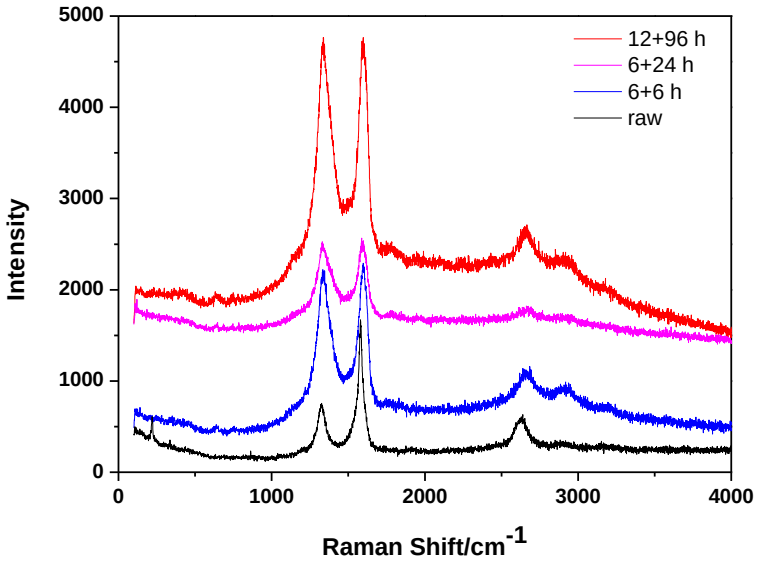

Figure S5: Raman spectra of the samples.

The experimental details.

Oxidative treatment of P-MWCNTs. 0.1 g of P-MWCNTs were firstly treated by 10 ml of mixed acids (H_2SO_4:HNO_3, ratio 3:1) under sonication for 6 h at 60℃, and then allowed to stand for different oxidation times. After that the products were washed by distilled water and centrifugation until the filtrate reaches to pH 7, and then dried at 100 ℃. The obtained products were donated as S-MWCNTs. As the longer of standing time, the level of oxidation was increased, and the obtained products were donated as graphene oxide nanoribbons (GONRs) and graphene oxide nanopieces (GONPs).

Characterization of S-MWCNTs, GONSs and GONPs. The UV-Vis spectra were recorded on a PerkinElmer Lambda 950 spectrometer, in which the products were dispersed in water by sonication for 80 min. The Fourier transform infrared spectroscopy (FTIR) spectra were measured by a Thermo NEXUS 670 Fourier transform infrared spectrometer. Transmission electron microscopy (TEM) images were obtained by using a TEM-3100F transmission electron microscopy with accelerating voltage of 200 KV. The fluorescence measurements were performed on a PerkinElmer LS 55 spectrometer, in which the dispersions in water were used.

Determination of the quantum yields. Determination of the quantum yields of these oxidized produces was accomplished by comparison of the wavelength integrated intensity of these oxidized products to that of the standard quinine sulfate. The optical density is kept below 0.05 to avoid inner filter effects. The quantum yields of these oxidized products were calculated using

$$\Phi = \Phi_S [(I \cdot A_S)/(I_S \cdot A)]$$

where Φ is the quantum yield, I is the integrated intensity, A is the optical density. The subscript S refers to the standard reference of known quantum yield. In this work, quinine sulfate was chosen as the standard, whose quantum yield is 0.577.