

Supporting Information

Preparation of Small-Sized Graphene Oxide Sheets from Carbon Nanohorns and Their Biological Applications

Minfang Zhang, Toshiya Okazaki, Yoko Iizumi, Eijiro Miyako, Ryota Yuge, Shunji Bandow, Sumio Iijima, Masako Yudasaka

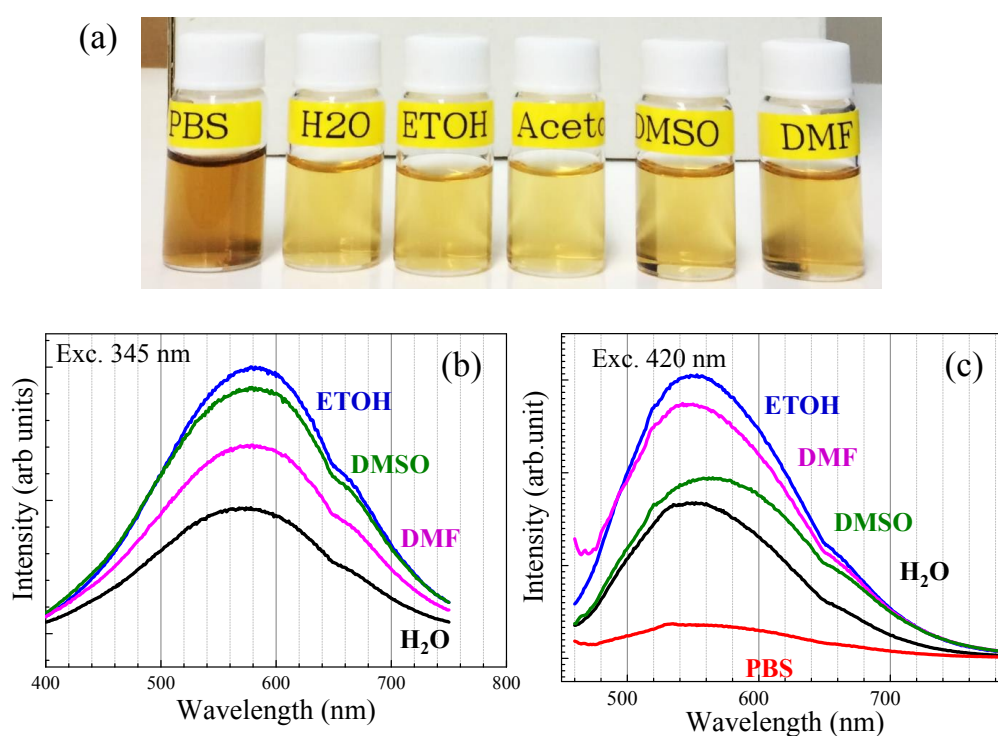


Figure S1. (a) Dispersion of the prepared S-GO in various solvents. (b, c) Fluorescence spectra of S-GO dispersed in organic solvents at excitation wavelengths of 345 nm (b) and 420 nm (c).

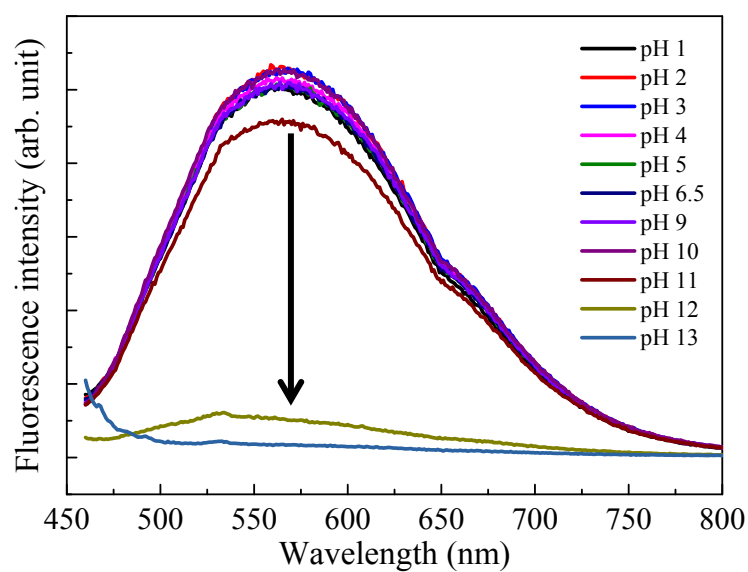


Figure S2. The fluorescence spectra of the prepared S-GO sample in aqueous solutions with different pH levels. The arrow indicates the fluorescence intensity decrease of S-GO in basic pH solutions.

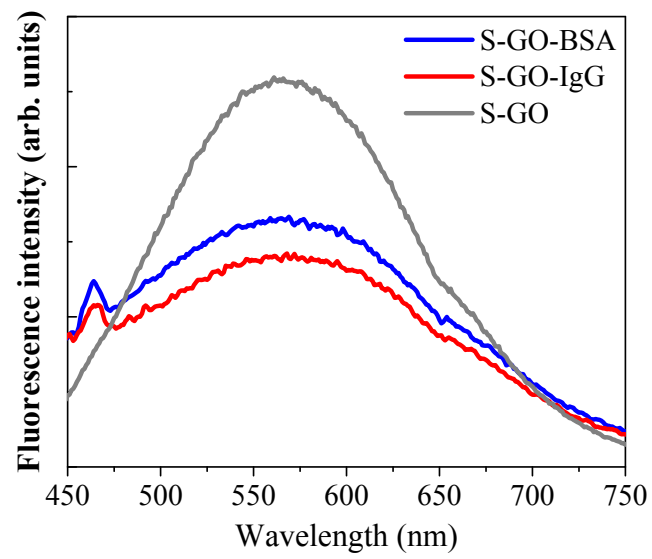


Figure S3. The fluorescence spectra of S-GO-IgG and S-GO-BSA at an excitation wavelength of 400 nm.

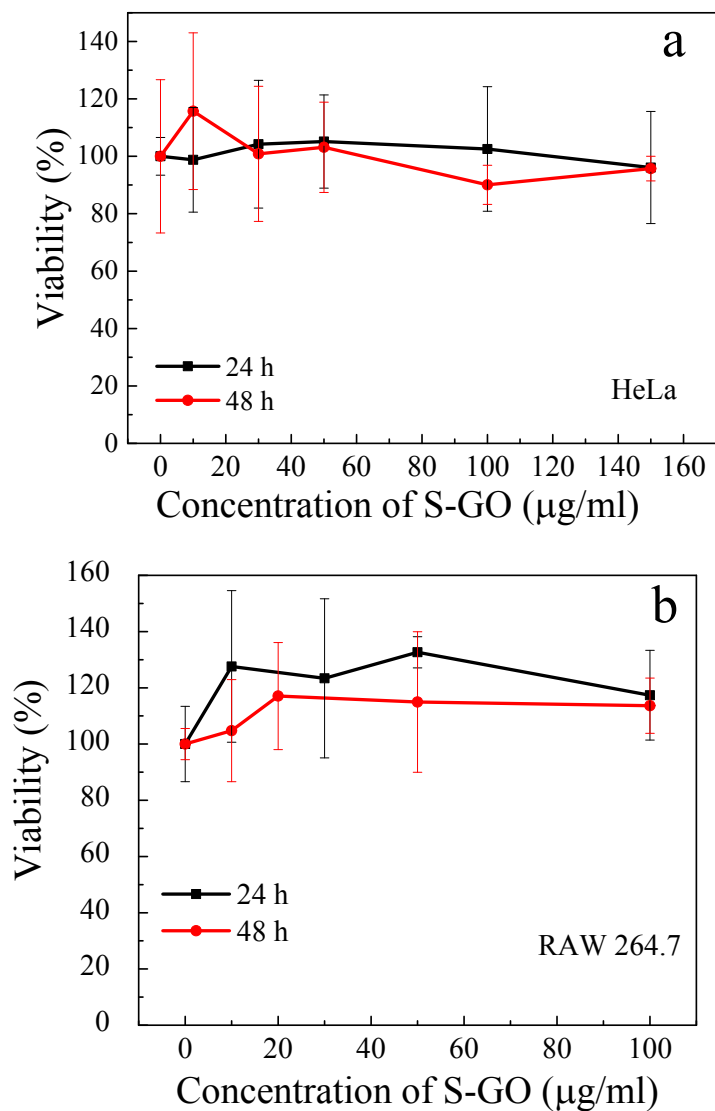


Figure S4. The cytotoxicity of S-GO to HeLa cells (a) and RAW 264.7 macrophages (b), determined using a WST-1 assay. All data represent the mean \pm SD of six independent replicates.

Equation S1.

The quantum yield of S-GO dispersed in ethanol was estimated using the following equation,^[1] where QY is the quantum yield, I is the measured integrated emission intensity, η is the reflective index of the solvent, A is the optical absorption density, subscript “st” refers to a standard with known quantum yield (here, the standard sample used was a fluorescein-ethanol solution; QY_{st} = 0.79)^[2], and subscript “x” refers to the sample.

$$QY_x = QY_{st} \left(\frac{I_x}{I_{st}} \right) \left(\frac{\eta_x}{\eta_{st}} \right)^2 \left(\frac{A_{st}}{A_x} \right)$$

The fluorescence spectrum and absorbance were measured at an excitation wavelength of 480 nm in a 10 × 10 mm fluorescence cuvette. The results are shown in Table S1.

[1] J. N. Demas, and G. A. Crosby, *J. Phys. Chem.* **1971**, 75, 991–1023.

[2] R. E. Kellogg, and R. G. Bennett *J. Chem. Phys.* **1964**, 41, 3042-3045.

Table S1. The quantum yield of S-GO at an excitation wavelength of 480 nm.

Sample	Integrated emission intensity (<i>I</i>)	Absorbance at 480 nm	Refractive index of solvent (η)	Quantum yield (<i>Q</i>)
Fluorescein	2066715	0.2638	1.36	0.79
S-GO	57248	0.147	1.36	0.039

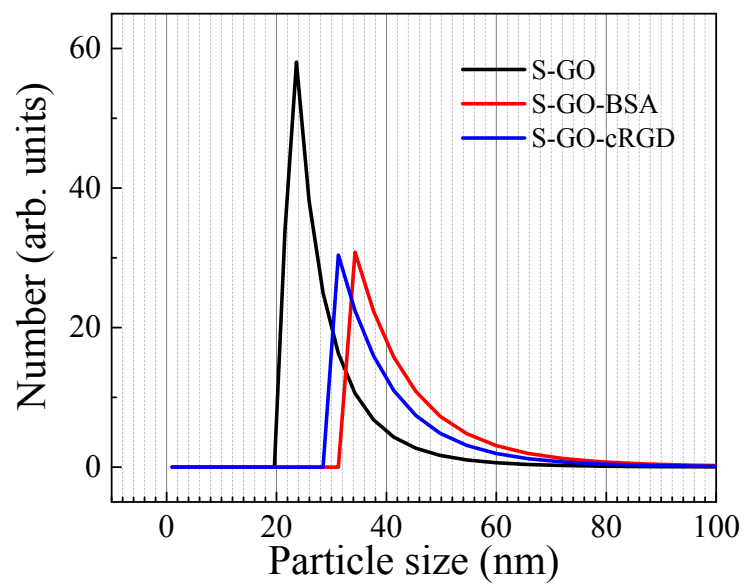


Figure S5. DLS measurements of aqueous dispersions of S-GO-BSA, S-GO-cRDG and S-GO particles.