Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B
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Supporting information

Chiral imaging in living cells with a functionalized graphene oxide

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Data Analysis and Fitting

All fittings were performed in a nonlinear manner according to spectrofluorometric titrations.[1] For the direct host-guest titrations, the complexation process of the β-CD-GO host (H) with the dye guest D/L-Phe-F (G) was expressed by *eq.1* according to a 1:1 host-guest binding stoichiometry and the complex stability constant (Ka) is given by *eq.2*

$$H + G \xrightleftharpoons{K_a} H\cdot G \quad (1)$$

$$K_a = \frac{[H\cdot G]}{[H]\cdot[G]} \quad (2)$$

where △F and △ε′ denote the changes in the fluorescence intensity and molar extinction coefficient of the chromophoric β-CD-GO derivative upon inclusion complexation of the D/L-Phe-F.

$$\triangle F = \triangle\varepsilon' [H\cdot G] \quad (3)$$

Solving the simultaneous equations, we obtained eq 4.

$$\Delta F = \frac{\Delta\varepsilon'([H]_0 + [G]_0 + \frac{1}{K_a}) \pm \sqrt{\Delta\varepsilon'^2([H]_0 + [G]_0 + \frac{1}{K_a})^2 - 4\Delta\varepsilon'^2[H]_0[G]_0}}{2} \quad (4)$$

The complex stability constant Ka and the sensitivity factor △ε′ were calculated by nonlinear fitting using the value of △F observed at each initial guest concentration $[G]_0$.

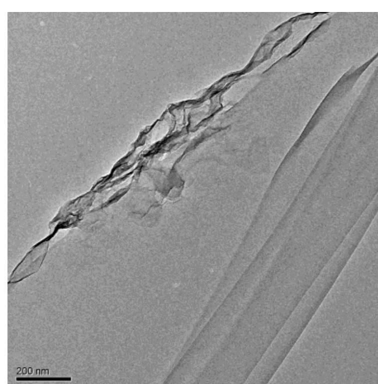

Figure S1. TEM images of the GO.

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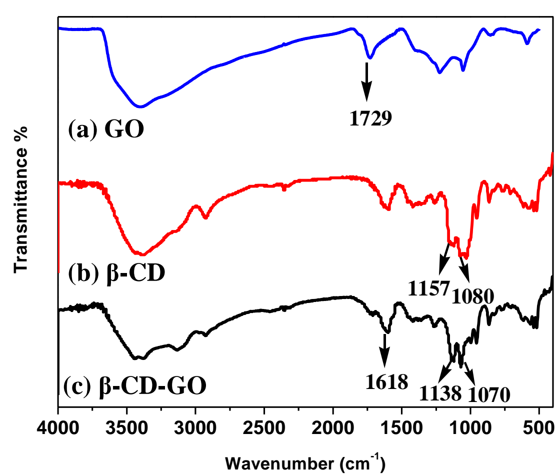

Figure S2. FT-IR spectra of a) GO, b) pure mono-6-amino-β-CD, and (c) β-CD-GO.

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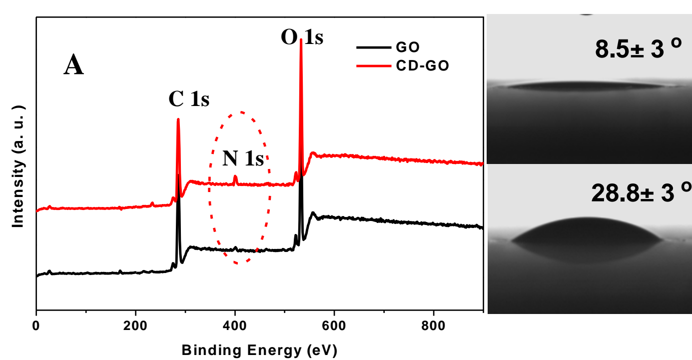


Figure S3. (A) XPS spectra of the original GO (curve black) and β-CD-GO (curve red); (B) Water drop profile changes of β-CD-GO (top), and GO (bottom) measuring on glass slides.

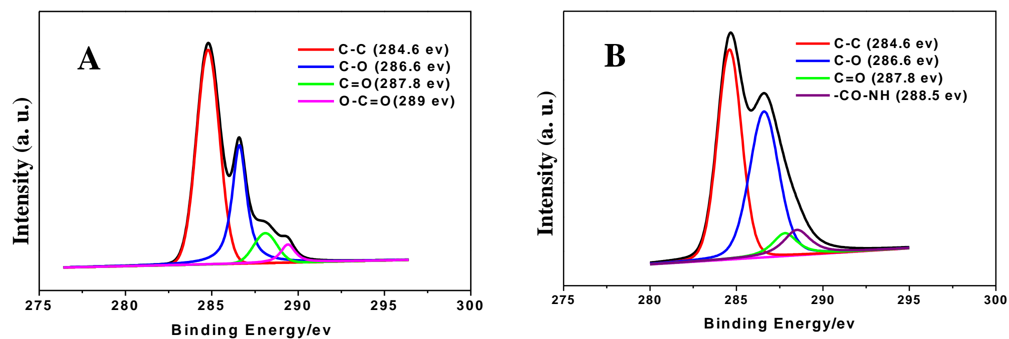
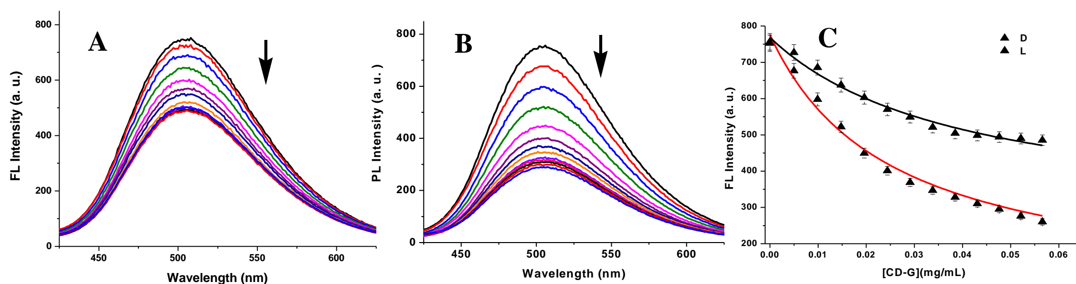
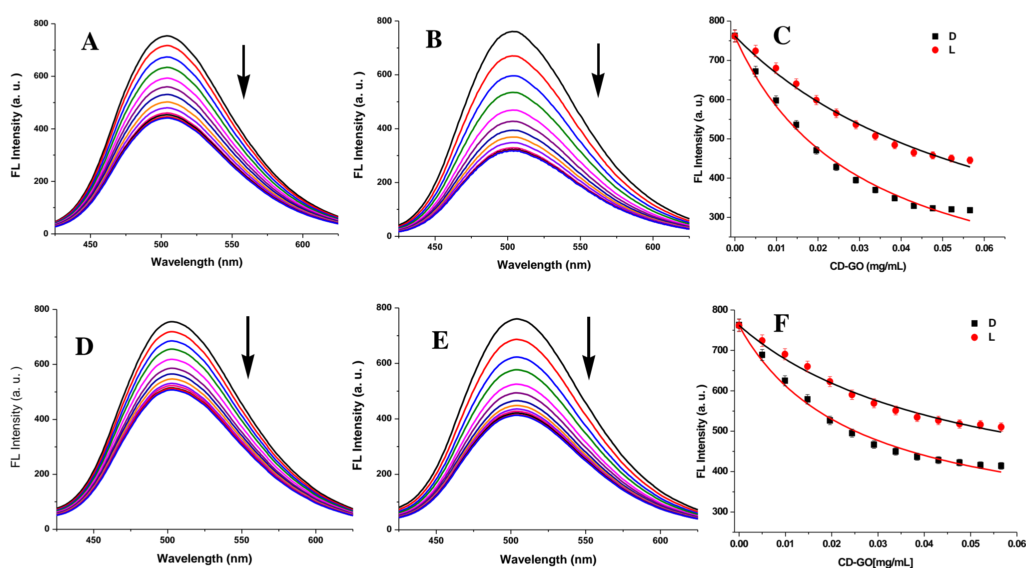


Figure S4. XPS C1s spectrum of A) GO; B) β-CD-GO.



FigureS5. Effect of increasing concentrations of native β-CD-GO on the fluorescence intensity of A) L-Phe-F, B) D-Phe-F (5×10^{-6} M). (excitation: 330 nm).

Parallel experiment with other two aromatic amino acids (tyrosine and histidine) has done to investigate the chiral sensing capacity of this platform. The chiral discrimination ratio (K_D/K_L) of β-CD-GO probe for D/L-Tyr-F and D/L-His-F is 2.18 and 1.91, respectively. Such parallel experiments indicated that this β-CD-GO sensor produced a good enantioselectivity of D-Phe-F with higher chiral discrimination ratio (K_D/K_L) toward other aromatic amino acids. Consequently, we choose D-phenylalanine as a model example for their biosensing device in the living cells.



FigureS6. Effect of increasing concentrations of β-CD-GO on the fluorescence intensity of A) L-Tyr-F, B) D-Tyr-F (10^{-5} M) (excitation: 330 nm); C) The increase in relative fluorescence intensity of D/L-Tyr-F at the same concentrations of β-CD-GO based on nonlinear fitting model (eq.4); The dependence of increasing β-CD-GO concentrations on the fluorescence intensity of D) L-His-F, E) D-His-F (10^{-5} M) (excitation: 330 nm); F) Effect of increasing concentrations of β-CD-GO on the fluorescence intensity of D/L-His-F based on nonlinear fitting model (eq.4).

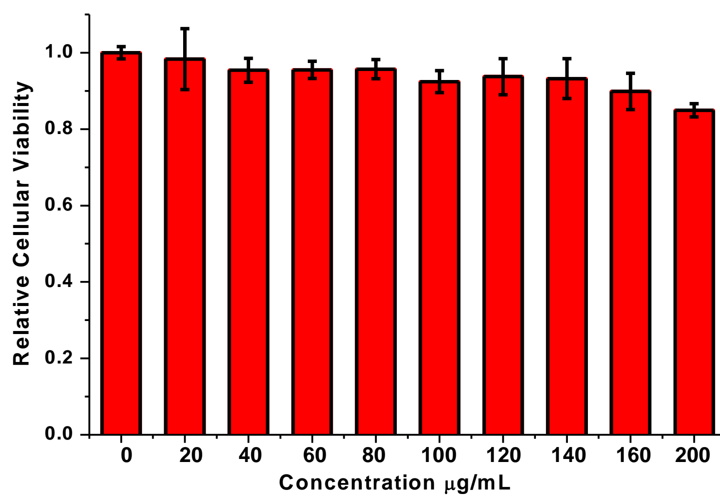
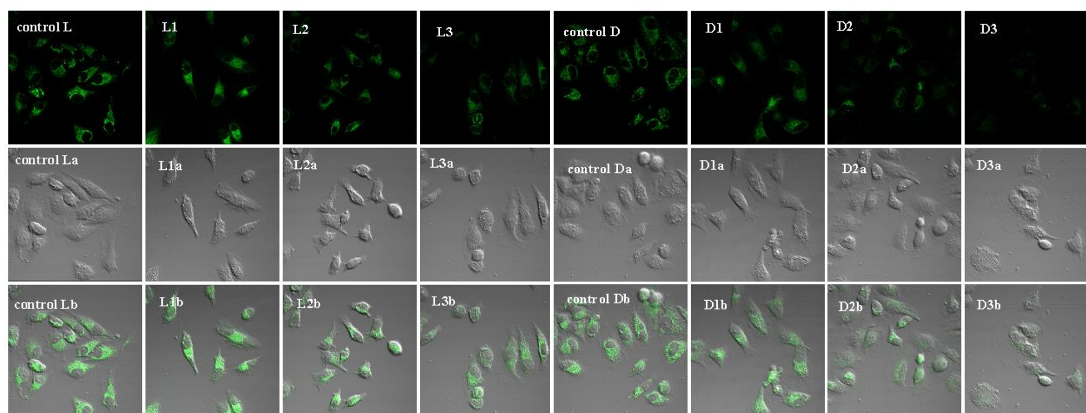


Figure S7. Relative cell viability of Hela treated with β-CD-GO. Hela cells were incubated with different concentrations of β-CD-GO for 24 h in fresh medium.



FigureS8. Confocal fluorescence microscopy images of Hela cells were incubated with D/L-Phe-F (control L and D), or incubated for 2~4 h at 37 ^{o}C with D/L-Phe-F and β-CD-GO at the concentration of 0.25 μg/mL (L1 and D1), 0.50 μg/mL (L2 and D2), 0.75 μg/mL (L3 and D3) in sequence, and the images were obtained after extensive washing of cells with PBS. Bright-field (top), dark-field fluorescence (middle), and overlap of images of dark and bright field (bottom), respectively.

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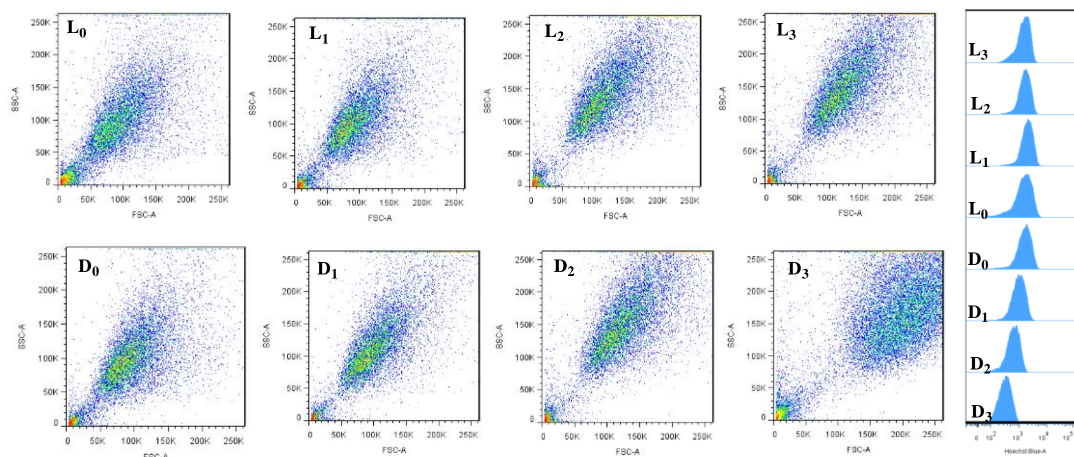

FigureS9. The mean fluorescence intensity of Hela cells incubated with D/L-Phe-F and without β-CD-GO (L_0 and D_0), or with β-CD-GO at the concentration of 0.25 μg/mL (L_1 and D_1), 0.50 μg/mL (L_2 and D_2), 0.75 μg/mL (L_3 and D_3) in sequence for 2-4 h at 37 °C, and the measurement were carried out after extensive washing of cells with PBS, which analyzed by flow cytometry.

1 Y. J. Zhang, W. X. Cao, J. Xu, *Chin. J. Chem.*, 2002, **20**, 322; Y. Liu, B. H. Han, S. X. Sun, T. Wada, Y. Inoue, *J. Org. Chem.* 1999, **64**, 1487; Y. Matsui, K. Mochida, *Bull. Chem. Soc. Jpn.*, 1979, **52**, 2808.