# Electronic Supplementary Information

# Mg/N double doping strategy to fabricate extremely high luminescent carbon dots for bioimaging

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Table S1 Compositions of different carbon sources

| | Citric acid | Magnesium hydroxide | ethylenediamine | Distilled water |
|---|---|---|---|---|
| CDs | 10 g | 0 | 0 | 40 mL |
| Mg-CDs | 10 g | 4.2 g | 0 | 40 mL |
| EDA-CDs | 10 g | 0 | 5 mL | 40 mL |
| Mg-EDA-CDs | 10 g | 4.2 g | 5mL | 40 mL |

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## Measurement of fluorescence quantum yields

The quantum yield of the CDs was determined by a comparative method introduced by Zhou and cooperators (J. G. Zhou, C. Booker, R. Y. Li, X. T. Zhou, T. K. Sham, X. L. Sun and Z. F. Ding, J. Am. Chem. Soc., 2007, 129, 744.). Quinine sulfate in 0.1 M $H_2SO_4$ (quantum yield: 54%) was selected as a standard sample to calculate the QY of test sample (i.e. CDs) which was dissolved in ultra pure water with different concentrations. All the absorbance values of the solutions at a certain excitation wavelength were measured with UV-Vis spectrophotometer. Photoluminescence (PL) emission spectra of all the sample solutions were recorded by FLS920 fluorometer at an excitation wavelength of 360 nm. The integrated fluorescence intensity is the area under the PL curve in the wavelength range from 360 to 500 nm. Then a graph was plotted using the integrated fluorescence intensity against the absorbance and a trend line was added for each curve with intercept at zero. Absolute values of the fluorescence quantum yield were calculated using the following equation:

$$QY_X = QY_{ST} (G_X/G_{ST}) (\eta_X/\eta_{ST})^2$$

Where the subscripts ST and X denote standard and test respectively, QY is the fluorescence quantum yield, G is the gradient from the plot of integrated fluorescence intensity vs absorbance, and $\eta$ is the refractive index of the solvent. In order to minimize re-absorption effects, absorbance in the 10 mm fluorescence cuvette should never exceed 0.12 at the excitation wavelength.

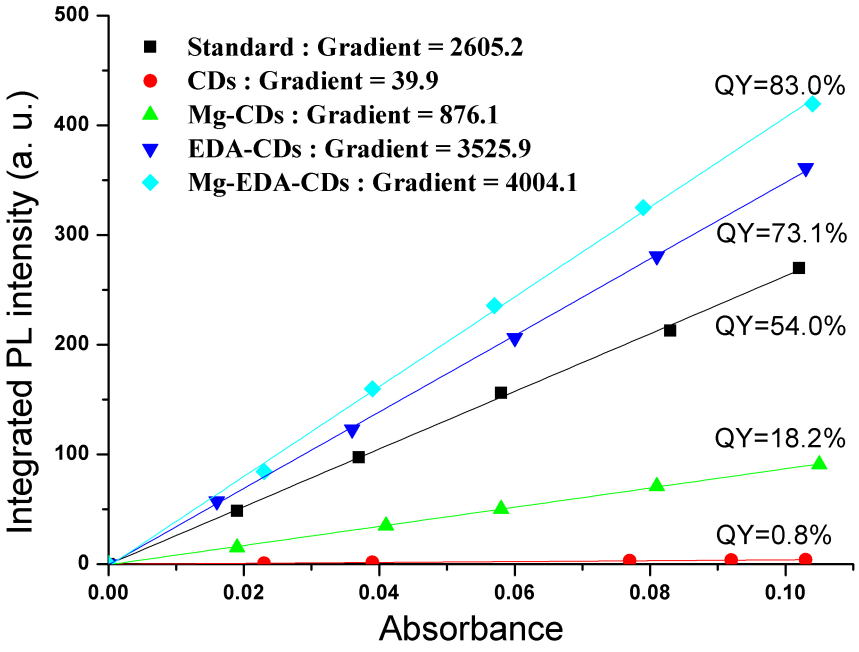


**Figure S1**. Photoluminescence and absorbance of CDs (excited at 360nm).

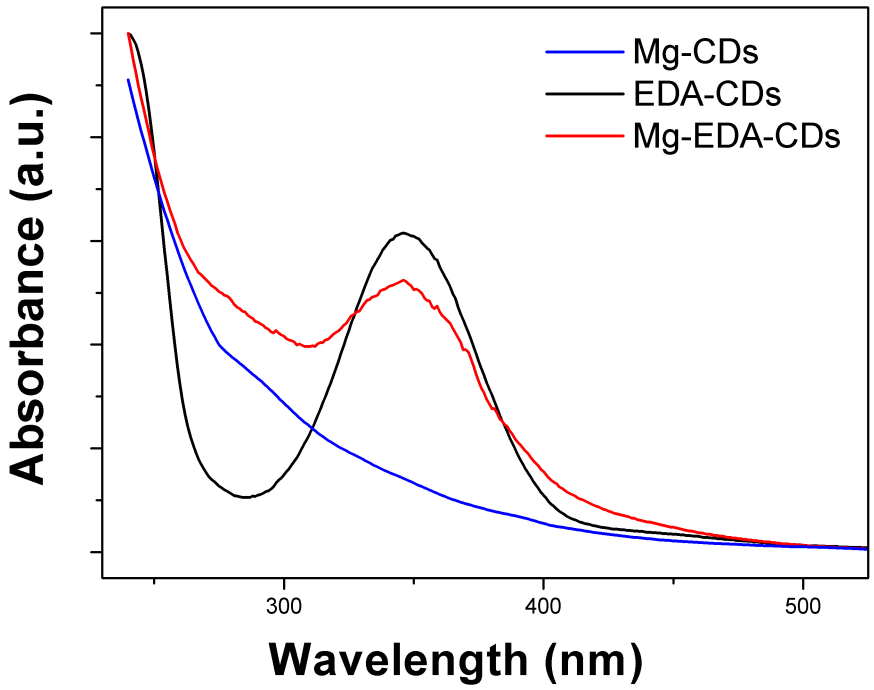


**Figure S2.** The UV-Vis spectra of the as-prepared CDs.

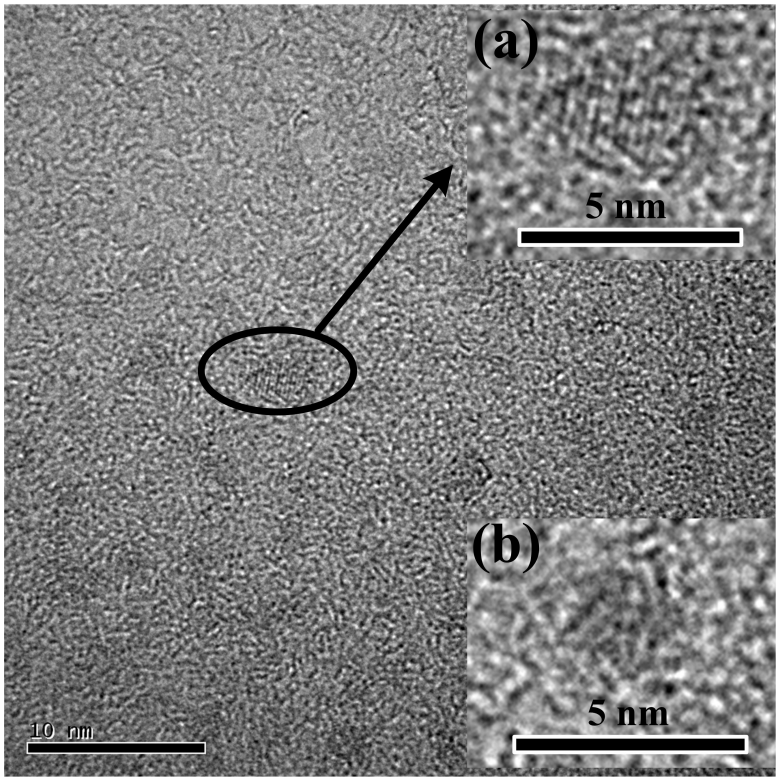


**Figure S3.** HRTEM images of Mg-EDA-CDs.
(a) lattice carbon core; (b) amorphous carbon

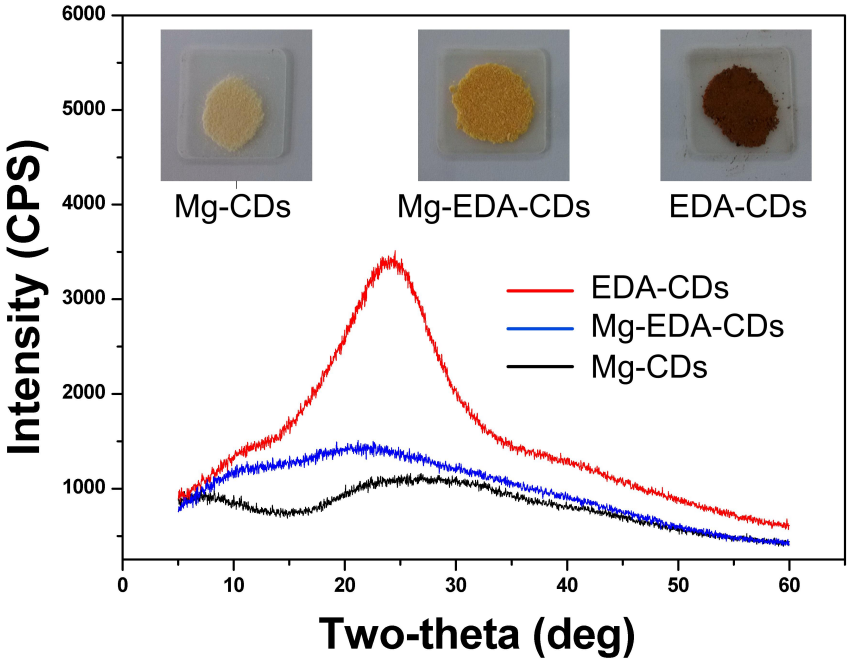


**Figure S4**. XRD patterns and optical photos of the as-prepared CDs.

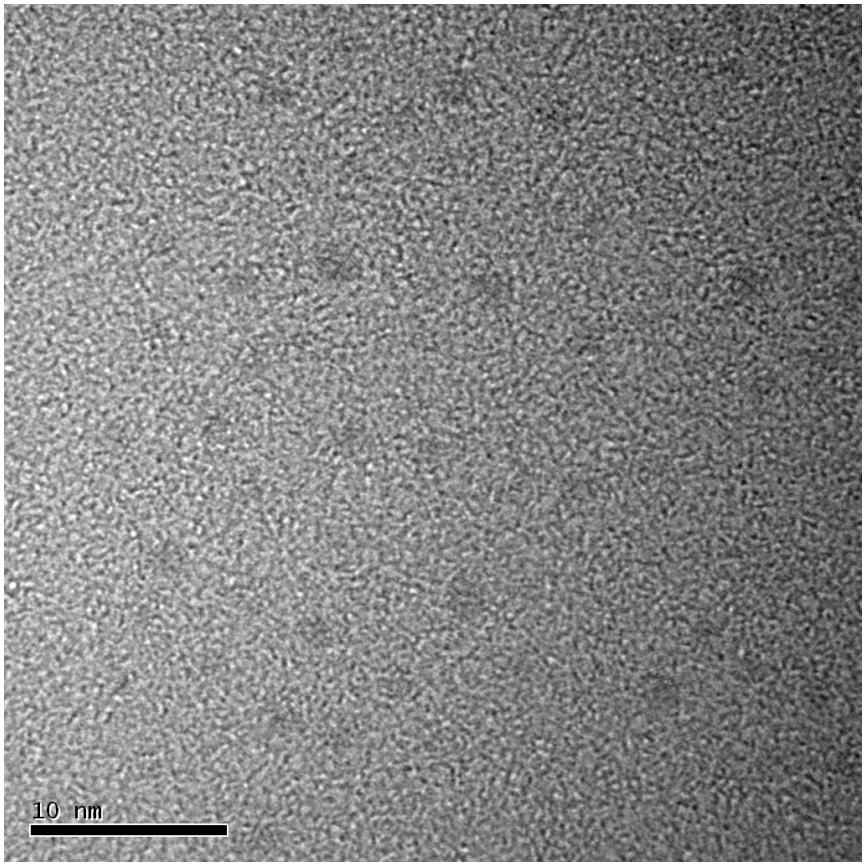


**Figure S5.** HRTEM image of none-doped CDs.

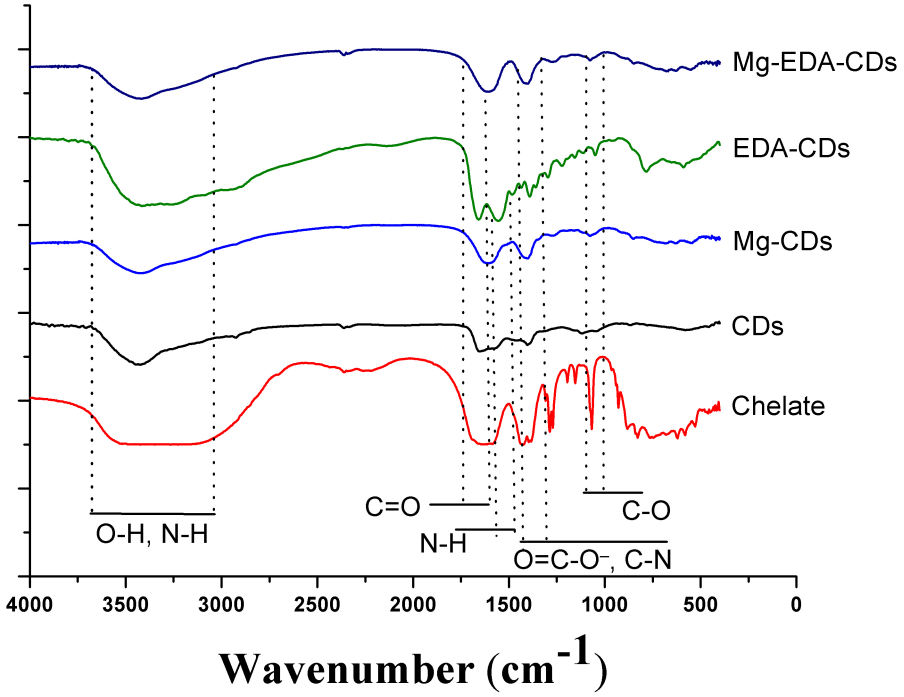


**Figure S6**. FTIR spectra of the as-prepared CDs.

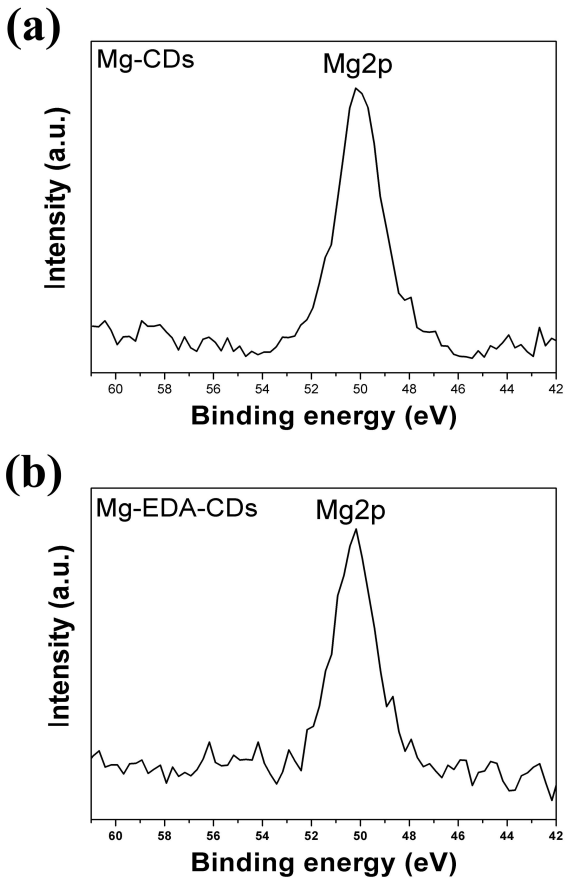


**Figure S7**. XPS Mg2p spectra of Mg-CDs (a) and Mg-EDA-CDs (b).

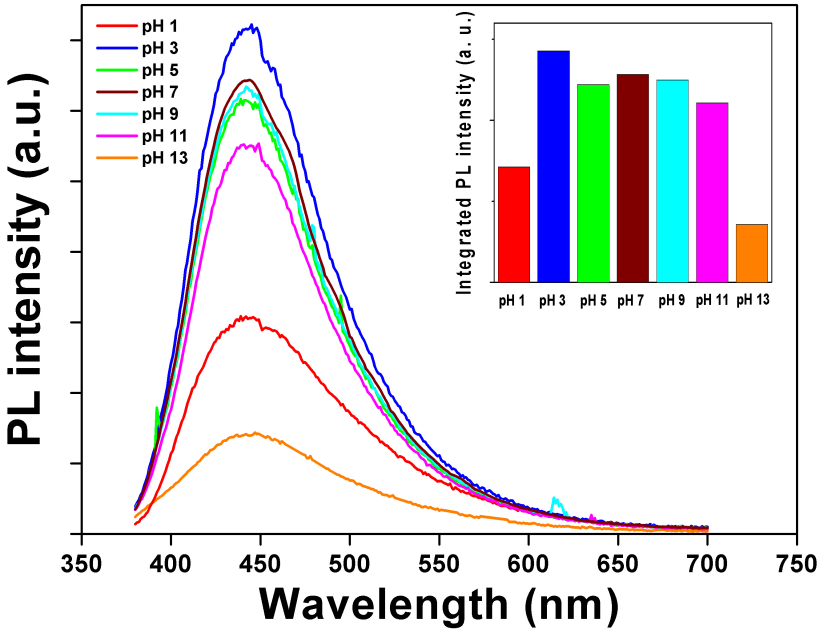


**Figure S8**. Effect of pH on the PL intensity of Mg-EDA-CDs.

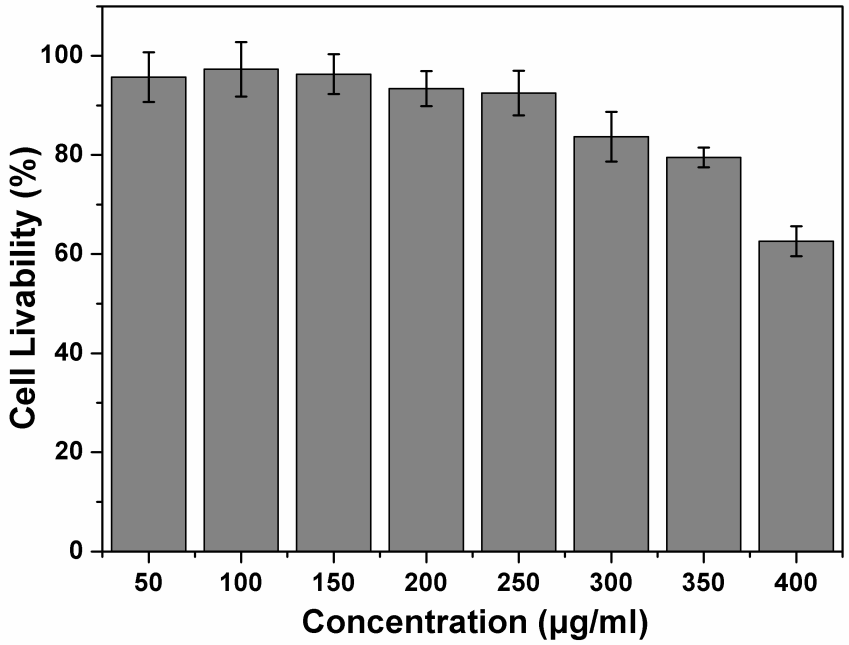


**Figure S9**. Cytotoxicity testing results of CDs via a MTT assay. The values represent percentage cell viability (means ± SD, n = 3)

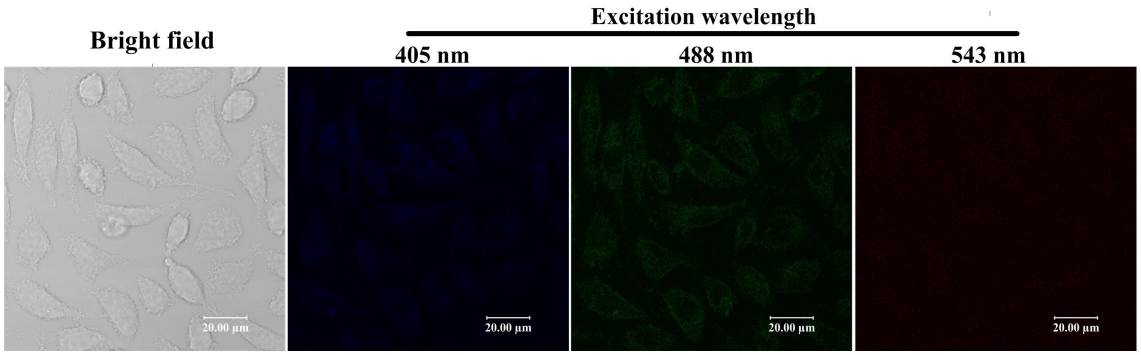


**Figure S10.** Laser scanning confocal microscopy images of L929 cells labeled without CDs, and emission light was collected in the range of 432 – 490 nm, 516 – 551 nm and 595 – 657 nm, respectively. Scale bars: 20 μm.

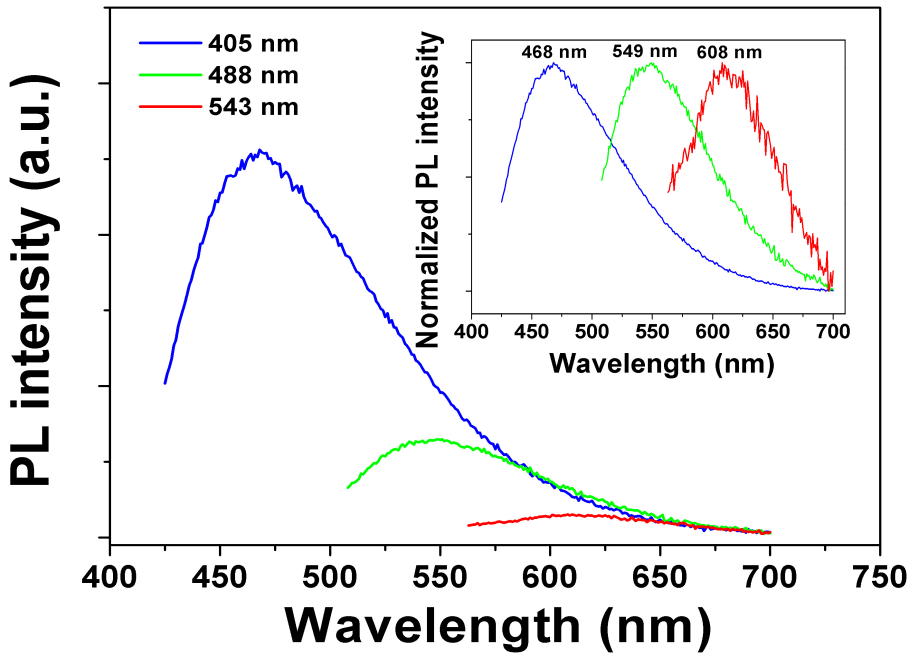


**Figure S11.** PL emission spectra of Mg-EDA-CDs excited at 405nm, 488nm and 543nm (insets: the normalized PL emission spectra)

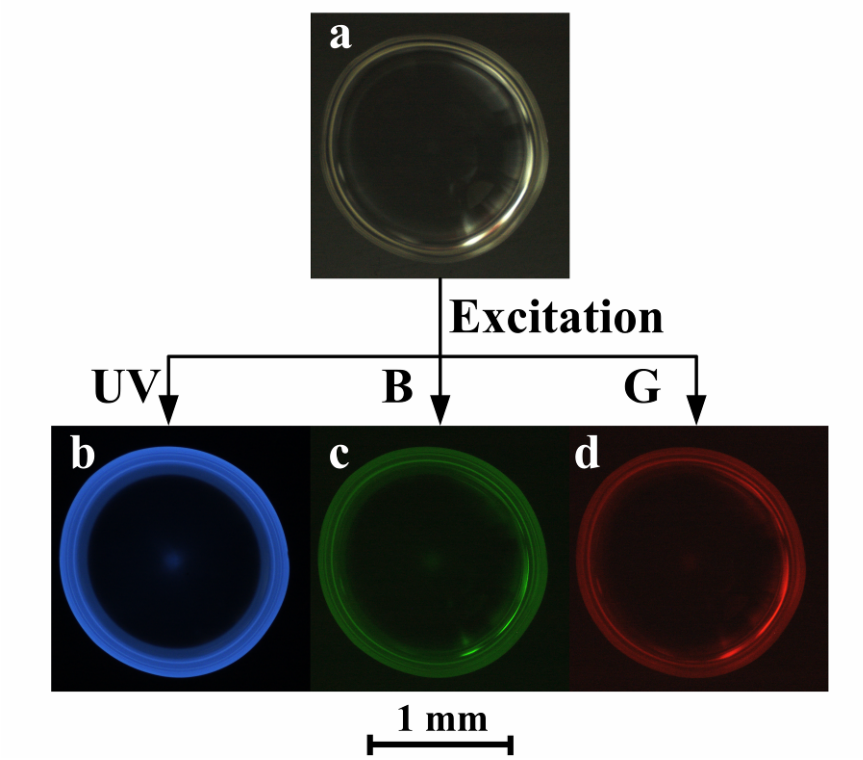


**Figure S12.** Fluorescent microscopy images of diluted aqueous solution containing Mg-EDA-CDs under (a) white, (b) ultraviolet (330 – 385 nm), (c) blue (460 – 495 nm) and (d) green (530 – 550 nm) light excitation (all scale bars: 1.0 mm); the pictures were taken by a Nikon Ti-S optical system microscope (Japan).