Supporting Information

One-step and high yield-simultaneous preparation of single- and multi-layer graphene quantum dots from CX-72 carbon black

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Experimental section / methods

Elemental analysis: Elemental analysis of GQDs1 and GQDs2 was carried out using an organic elemental analyzer (Vario MICRO).

X-Ray photoelectron spectroscopy (XPS): XPS data for the GQD solutions deposited on glass substrates were measured by an ESCAlab 250 XPS system having an Al K source for determining the composition and chemical bonding configurations.

The Fourier transform infrared (FTIR): FTIR spectra for the GQDs were obtained on a FT-IR spectrophotometer (Thermo Nicolet 360).

X-ray powder diffraction (XRD): XRD patterns were obtained on a Japan Rigaku D/max-3C using Cu Ka radiation.

Atomic force microscopy (AFM): 1 μL suspension of GQDs was drop-cast on freshly cleaved mica surface and dried in air. The samples were imaged in air by tapping-mode on a Nanoscope IIIa (Digital Instruments) with NSC15 tips (silicon cantilever, MikroMasch).

High resolution transmission electron microscopy (HRTEM): HRTEM images were recorded on an electronic microscopy (TecnaiG2 F20S-TWIN 200KV).

UV/Vis spectroscopy: UV/vis spectra of GQDs were characterized by a UV/Vis

spectrophotometer (UV 2450).

Fluorescence spectroscopy: All fluorescence spectra were obtained by a fluroescence spectrophotometer (F-4600).

Cell culture: MCF-7 cells were grown in Dulbecco's Modified Eagle's Medium (DMEM) (PAA Laboratories, Pasching, Austria) supplemented with 10% heat inactivated fetal bovine serum (PAA laboratories), 1 mM L-glutamine (Gibco, Grand Island, NY) and 50 U/mL penicillin/streptomycin (Gibco) in a humidified incubator with 5.0% CO_2 at 37^{o}C.

Cell Viability Assay: The viability and proliferation of cells in the presence of nanoparticles were evaluated using 3-[4,5-dimethylthialzol-2-yl]-2,5-diphenyltetrazolium bromide (MTT) assay. The MTT assay was performed in triplicate in the following manner. MCF-7 cells were seeded into 96-well plates at a density of 1×10^4 per well in 200 µL of media and grown overnight. The cells were then incubated with various concentrations of GQD sample for 24 h. Following this incubation, cells were incubated in media containing 0.5 mg/mL of MTT for 4 h. Thereafter, the MTT solution was removed and the precipitated violet crystals were dissolved in 200 µL of DMSO. The absorbance was measured at 570 nm using a BioTek microplate reader.

Cell imaging: Cells were seeded at a density of 1×10^4 cells/cm^2 onto poly-L-lysine (0.1 mg/mL) coated coverslips for cell attachment overnight. The cells were then incubated with 100 ug/mL GQD sample. After 4 hrs, the cells were washed three times with PBS buffer and the fluorescence images were acquired by confocal laser scanning microscopy (CLSM) at 488 nm excitation (LSM 510 META, Carl Zeiss, Germany).

	C(wt%)	O(wt%, calculated)	N(wt%)	H(wt%)
GQDs1	41.29	54.27	1.76	2.68
GQDs2	52.12	44.76	1.45	1.67

Table S1. Elemental analysis results of the GQDs1 and GQDs2.

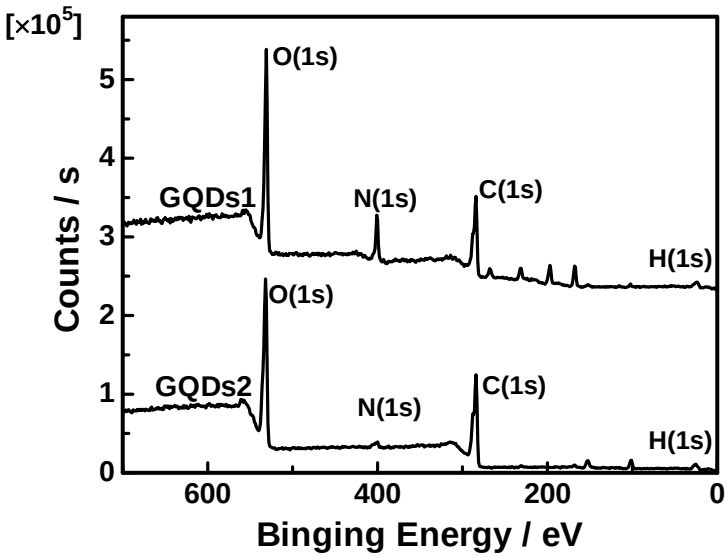

Figure S1. XPS of GQDs1 and GQDs2

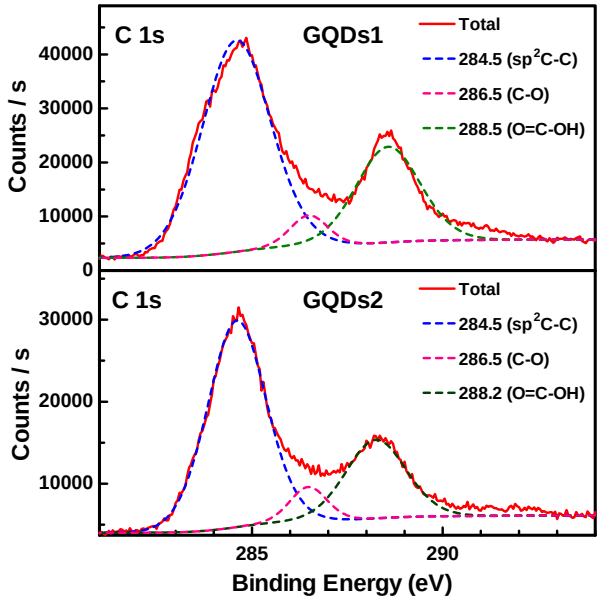

Figure S2. C1s spectra of GQDs1 and GQDs2.

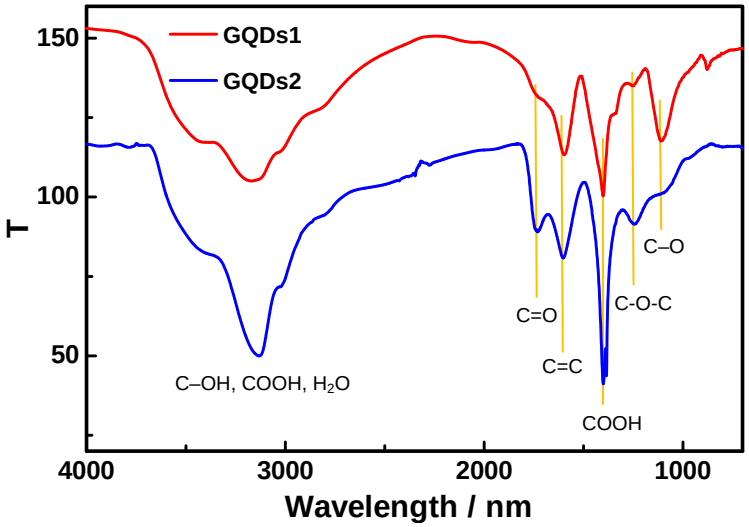

Figure S3. FTIR spectra of GQDs1 and GQDs2.

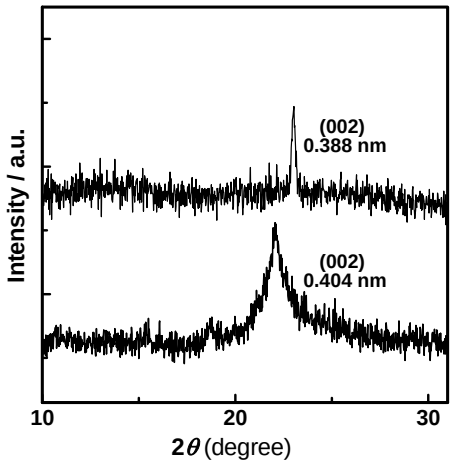

Figure S4. XRD pattern of GQDs1 and GQDs2.

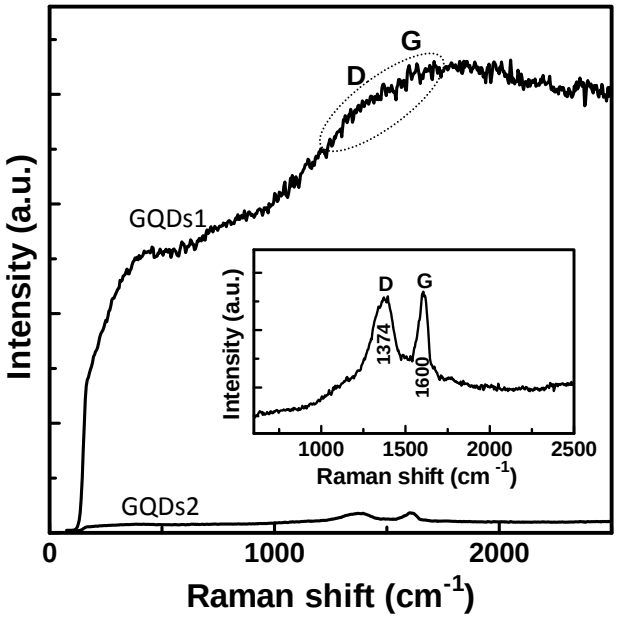

Figure S5. Raman spectra of as-prepared GQDs1 and GQDs2. Inset: Amplification of Raman spectra for the GQDs1.

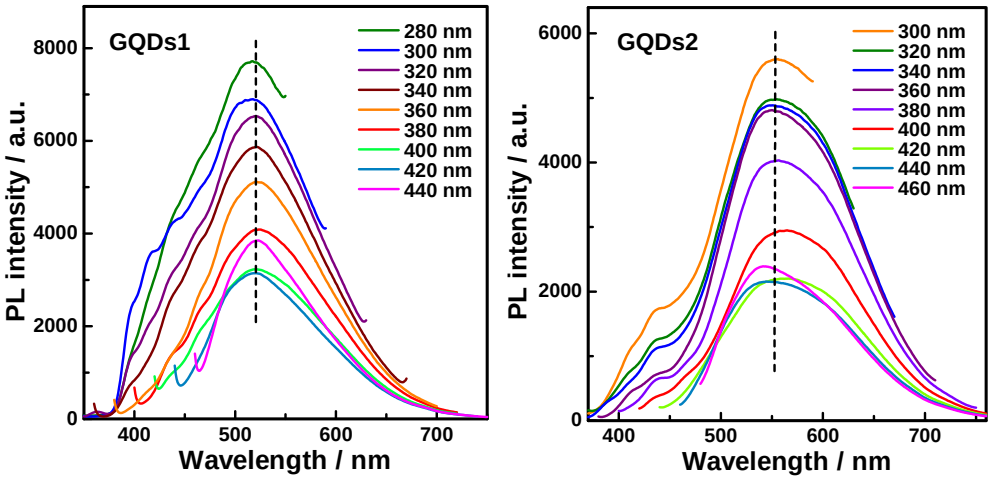

Figure S6. PL emission spectra (recorded for progressively longer excitation wavelengths in 20 nm increments) of GQDs1 and GQDs2 in water solution.

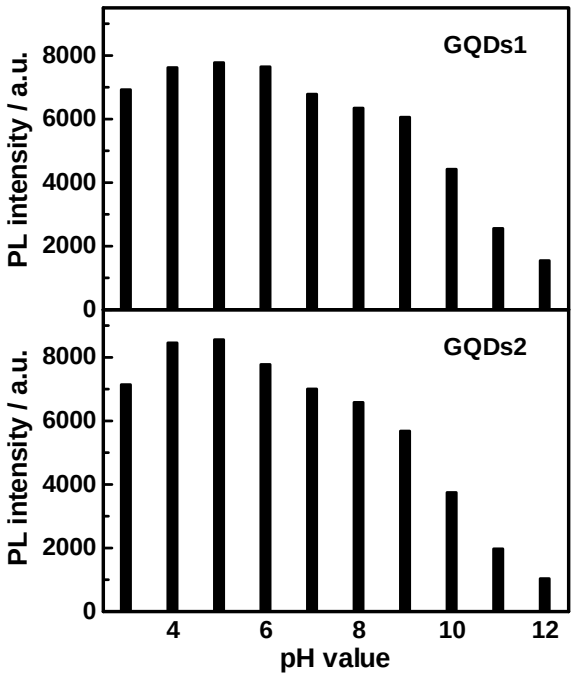

Figure S7. Effect of pH value on the PL intensity of GQDs1 and GQDs2.

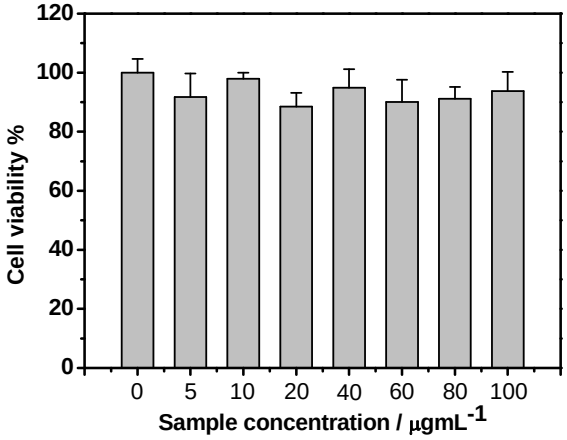

Figure S8. Cell viability assay with human breast cancer cell lines MCF-7 cell treated with different concentration of GQDs1.