Supporting Information

Fractional Photo-current dependence of Graphene Quantum Dots Prepared from Carbon Nanotubes

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Experimental:

Materials used:

Materials used include MWCNTs (95+ %Carbon purity, SRL, MWCNT Type 1, OD < 8 nm, Length: 10-30μm), DMF (by Alfa Aesar), potassium permanganate purified (Alfa Aesar), phosphoric acid (Alfa Aesar), hydrochloric acid (AR Grade), sulfuric acid (AR Grade), potassium hydroxide, and all aqueous solutions were prepared from ultra-pure water (›18 MΩ) from a Milli-Q system.

Chemical synthesis of GQDs:

The chemical route for the synthesis of GQDs were derived from ”Improved method” reported graphene oxide synthesis.[1] In a typical reaction, (1 : 7.5 weight ratio) MWCNTs and $KMnO_4$ mixture was added slowly to an approximately 250 mL of acid mixture (9:1 mixture of H_2SO_4 and H_3PO_4) and kept for stirring at 50˚C. After 15-20 min the temperature was raised to 70˚C for 35 h. After 35 h of heating, the mixture was cooled down to room temperature and filtered. The filtrate was neutralized with KOH solution and also an alternate sonication and centrifugation (7000 rpm) with de-ionised water was done several times to get uniform size distribution. Finally, the solution was filtered through a 0.2 μM pore size PTFE membrane and the filtrate was dialyzed for approximately 3 days and then dried up in a vacuum oven. The experiment was carried out several times to check the reproducibility.

Nanostructural and physical characterization of GQDs:

Transmission electron microscopy image of GQDs sample was taken using TEM (Make-FEI , Model-TECNAI G^2 20, Voltage-200 kV, Wave Length- 0.0024 nm).UV-Vis absorption spectra of GQDs in suspensions were carried out using UV-VIS-NIR Spectrophotometer (Varian, Cary 5000). Raman spectroscopy is carried out using Reneshawmake Laser Raman instrument. Photoluminescence studies were carried out using Fluorescence Spectrophotometer (make Varian). XRD was carried out using powder X-ray Diffractometer by Bruker and IR was done using BRUKER TENSOR 27 FT-IR Spectrometer.

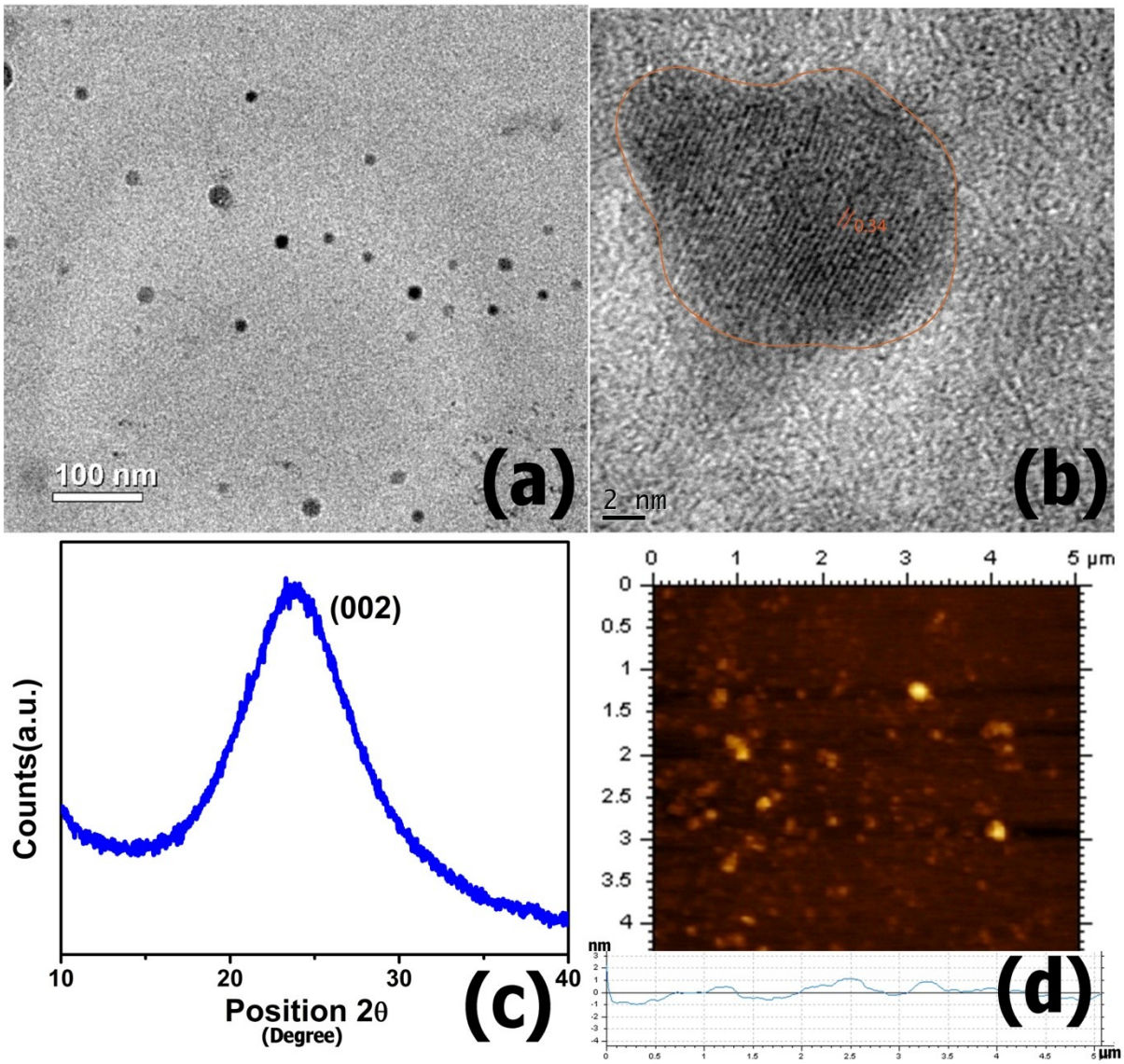

Figure S1 : (a) TEM image of 12 nm GQDs (b) HRTEM image of GQDs (c) XRD pattern of GQDs and (d) AFM image of GQDs with height profile

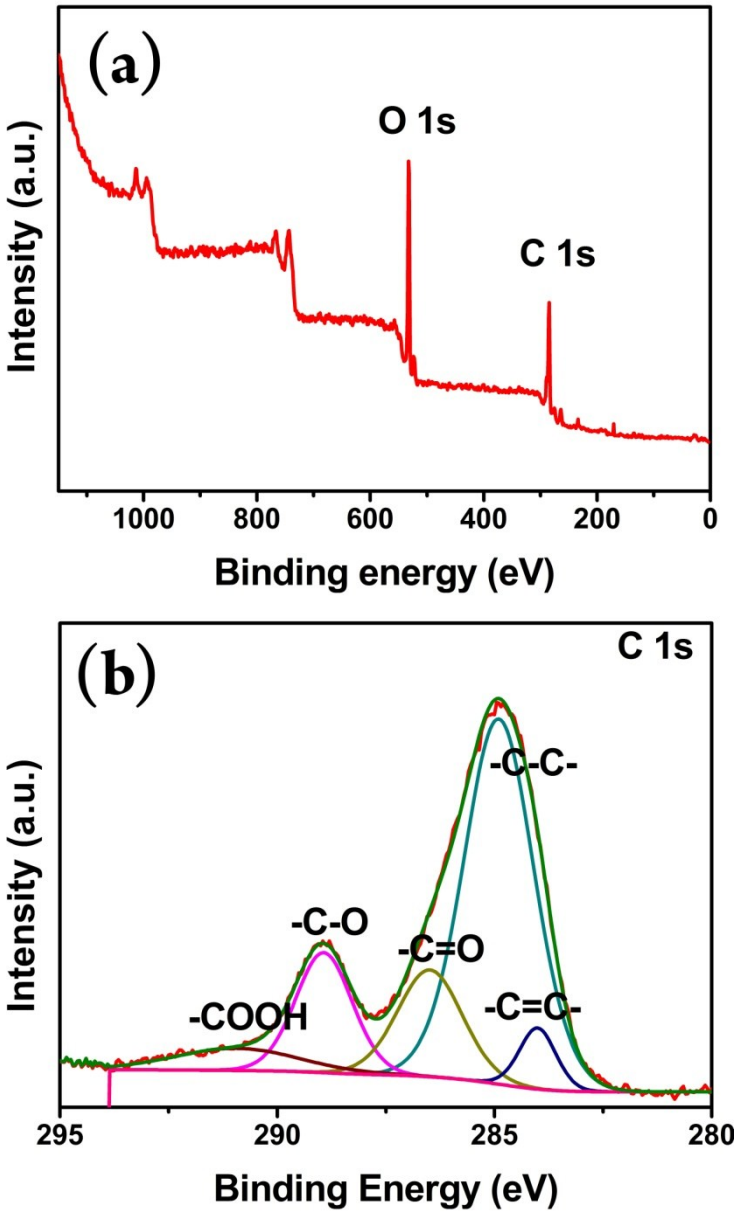

Figure S2 : XPS of GQDs (a) Survey spectrum and (b) High resolution XPS spectra of C1s

References:

1 D. C. Marcano, D. V Kosynkin, J. M. Berlin, A. Sinitskii, Z. Sun, A. Slesarev, L. B. Alemany, W. Lu and J. M. Tour, *ACS Nano*, 2010, **4**, 4806–4814.