Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Anomalous Fluorescence Enhancement and Fluorescence Quenching of Graphene Quantum Dots by Single Walled Carbon Nanotubes

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Calculation of Quantum Yield (QY):

Quantum yield has been calculated with respect to quinine sulphate (QS) in 0.05 M H_2SO_4, using the following formula:

$$Q_s = Q_r \frac{A_r I_s \eta^2{}_s}{I_r A_s \eta^2{}_r}$$

Here, Q_s and Q_r quantum yield of sample and reference (QS) respectively; A_s and A_r absorbance of the sample and reference respectively; I_s and I_r are integrated PL intensity of sample and reference respectively.η_s = Refractive index of sample; η_r = Refractive index of reference. QY of QS = 0.52[1, 2] and Refractive index of water 1.33. Here $\eta_s = \eta_r = 1.33$ has been uesd.

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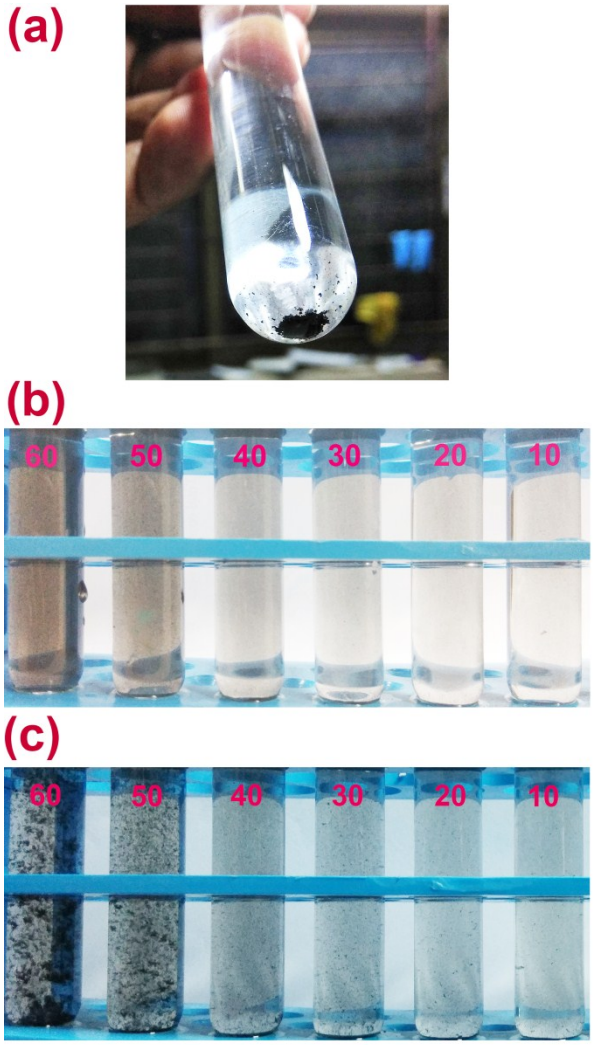

Figure S1: (a) Digital image of 0.6 mg SWCNTs in 10 mL MQ water before sonication showing precipitate. (b) Digital images of dispersion of SWCNTs in MQ water at different concentrations of SWCNTs (10-60 µg/mL denoted as 10, 20, ….., 60, respectively, from right to left). (b) The stability of the dispersion 20 min after ultra-sonication, which shows agglomeration above 50 µg/mL.

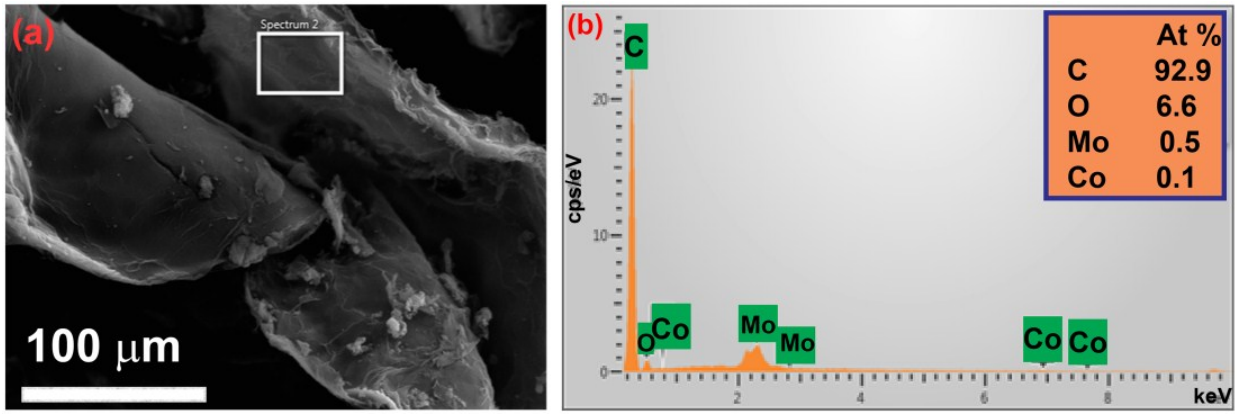

Figure S2: (a) FESEM image of SWCNTs, and (b) EDX spectrum of SWCNTs obtained from the square region shown in the (a)

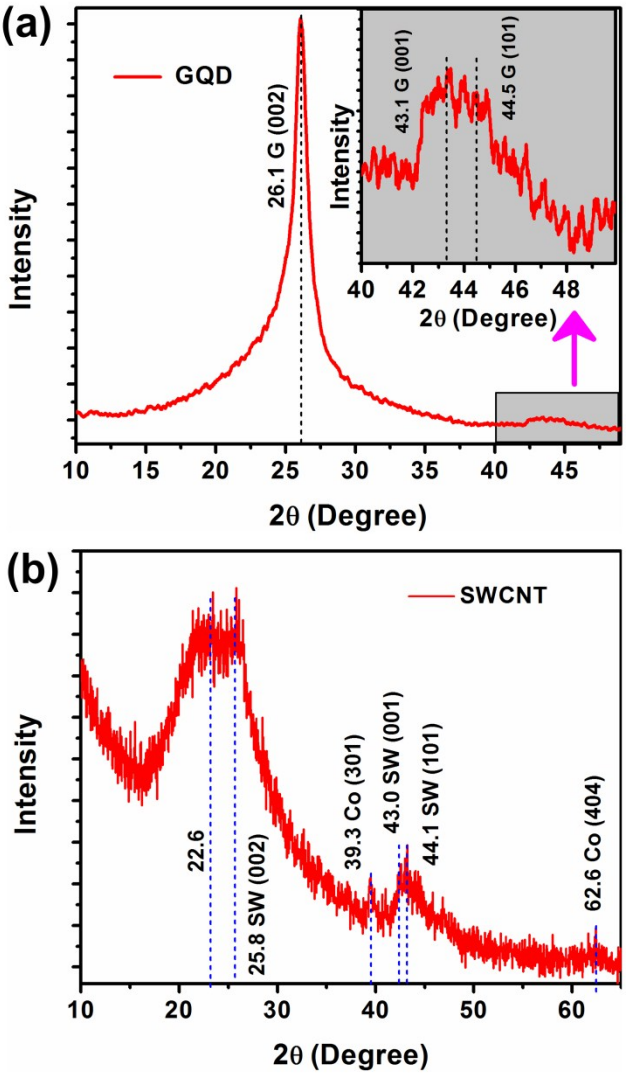

Figure S3: XRD pattern of (a) GQDs and (b) SWCNTs, showing the graphitic nature of the samples.

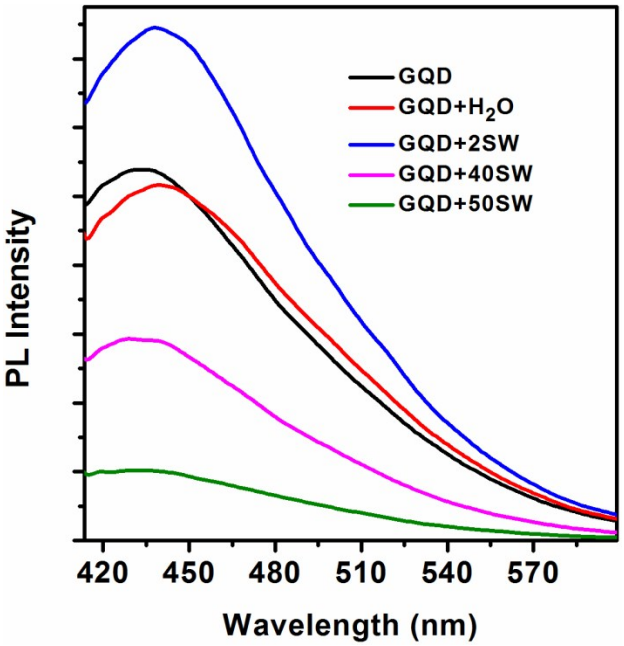

Figure S4: Dilution effect in the PL intensity of GQDs at 1.0 mg/ mL concentration

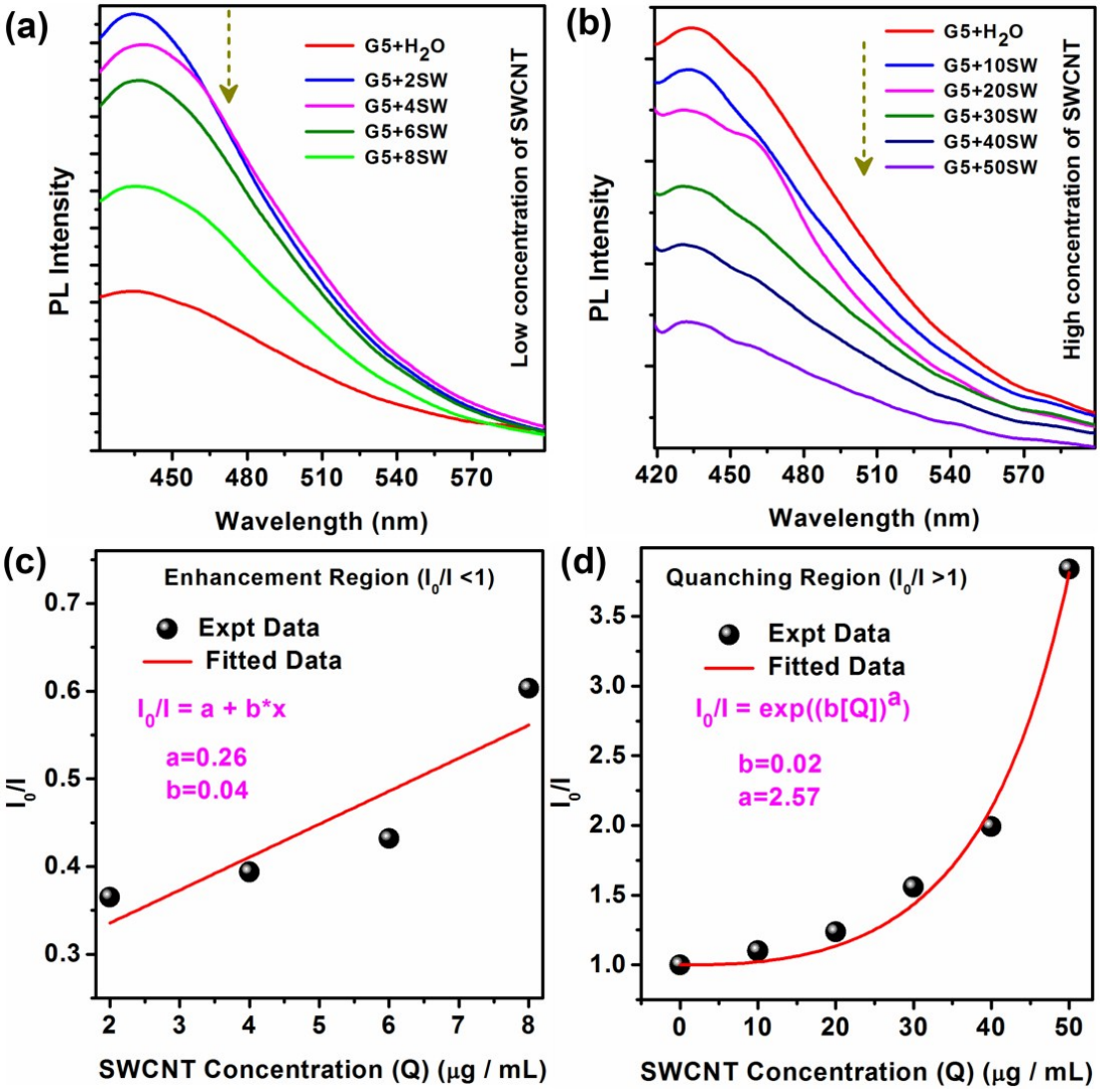

Figure S5: Evolution of the PL spectra of GQDs at 0.5 mg/mL concentration in presence of SWCNTs at (a) low (2,4,6 and 8 μg/mL) and (b) high (10,20,30,40 and 50 μg/mL) concentrations. (c) The PL intensity ratio, I_0/I vs. concentration of SWCNTs in the low concentration region, showing a linear behavior. (d) Stern–Volmer plot at high concentration of SWCNTs showing non-linearity and it is fitted with a compressed-exponential function. The code G5 represents 0.5 mg/mL concentration of GQDs.

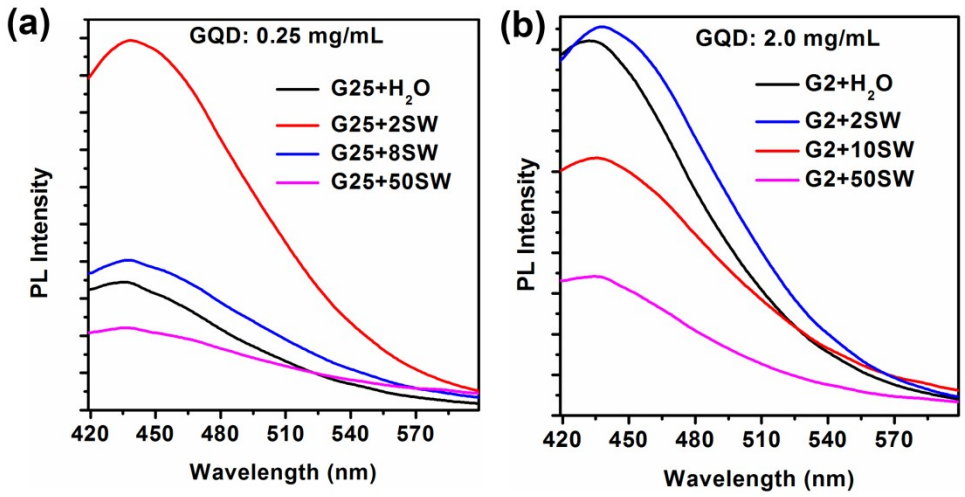

Figure S6: (a) Evolution of the PL spectra of GQDs (concentration of 0.25 mg/mL) in presence of SWCNTs at different concentrations. (b) The same for GQD concentration of 2 mg/mL. The code G25 is for 0.25 mg/mL and G2 is for 2.0 mg/mL of GQDs.

Table S1. Calculation of the chirality (n, m) of SWCNTs from the RBM. Both semiconducting and metallic SWCNTs are identified.

RBM (cm^{-1})	$d_t = 248/w_{RBM}$	*Chirality*	
		S(n,m)	*M(n,m)*
154.7	1.60	…	(16,7)
187.3	1.32	(13,6)	…
248.0	1.00	(11,3)	…
263.8	0.94	…	(12,0)

Table S2. Calculation of the quantum yield (QY) of GQDs before and after addition of SWCNTs.

Sample	QY (%)
GQD	2.38
GQD+2SW	5.51
GQD+4SW	3.91
GQD+6SW	4.26
GQD+8SW	4.09
GQD+10SW	2.56
GQD+20SW	2.16
GQD+30SW	1.64
GQD+40SW	1.27
GQD+50SW	0.61

Table S3. The fitment error factor value of fitted TRPL spectra.

Sample	τ_1(ns)	$\Delta\tau_1$(ns)	τ_2(ns)	$\Delta\tau_2$(ns)	B_1(%)	ΔB_1(%)	B_2(%)	ΔB_2(%)	χ^2	τ_{avg}(ns)
GQD+2SW	0.92	0.04	6.13	0.01	30.87	4.69	69.13	1.89	1.008	5.80
GQD	0.62	0.08	5.04	0.01	32.58	6.68	67.42	2.15	1.000	4.79
GQD+50SW	0.54	0.09	4.03	0.01	60.08	35.69	39.92	3.32	1.005	3.44

References:

1. K. Suzuki, A. Kobayashi, S. Kaneko, K. Takehira, T. Yoshihara, H. Ishida, Y. Shiina, S. Oishi and S. Tobita, *Physical Chemistry Chemical Physics*, 2009, **11**, 9850-9860.
2. M. Brouwer Albert, *Journal*, 2011, **83**, 2213.