

Supplementary Information for

Environmentally Benign Synthesis of Blue Fluorescent Graphene Quantum Dots for Nitroaromatic Sensing (*p*-Nitroaniline and 2,4,6-Trinitrophenol) and Nanophytotoxicity Analysis

Krishna Moni Deka^a, Saikat Das^a, Rachita Newar^a, Rajkanya Das^a, Bappi Sen^b, Hemen Sarma^b, Arabinda Baruah^{a,*}

^aDepartment of Chemistry, Gauhati University, Guwahati, Assam 781014, India

^bDepartment of Botany, Bodoland University, Rangalikhata, Deborgaon (BTR), Kokrajhar, Assam 783370, India

**Email ID of Corresponding author: arb@gauhati.ac.in*

Table of Contents

- 1. Stability analysis of GQDs**
- 2. Histogram for average particle size (nm) from a TEM image (Scale: 10 nm)**
- 3. PXRD pattern of Graphene oxide (GO), FTIR pattern of Graphene oxide (GO), FESEM image of GO, and EDAX analysis of GO**
- 4. Selectivity of GQDs for 2,4,6-Trinitrophenol (TNP) and Para-nitroaniline (PNA)**
- 5. Sample collection and preparation for the practical utility of GQDs**
- 6. Zeta potential measurements**
- 7. Data for recovery percentage and RSD%**
- 8. Various time line photograph of GQDs on the study of nanophytotoxicity**
- 9. Overall decay spectra**
- 10. EDAX analysis**

1. Stability analysis of GQDs

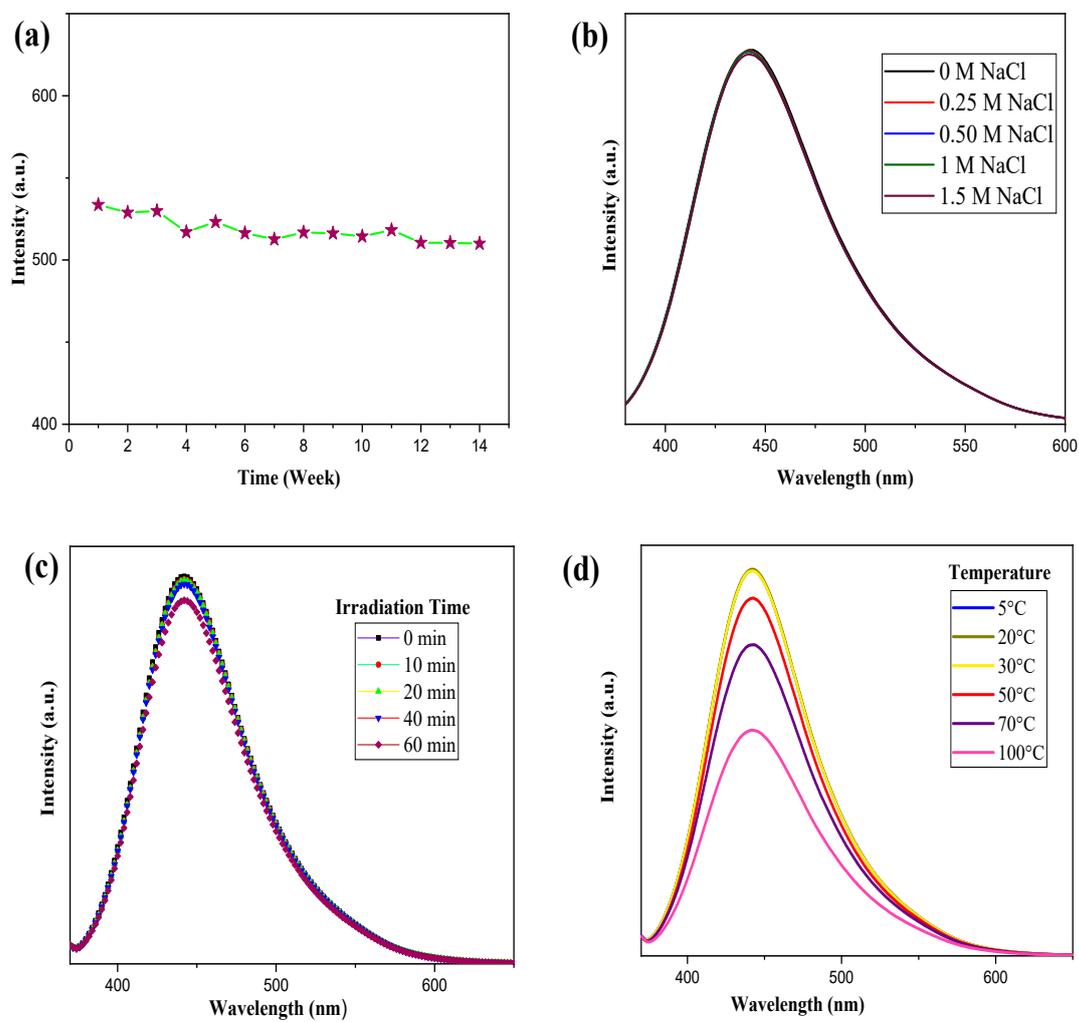


Figure S1: (a) Photostability of GQDs over 14 weeks (98 days); photostability of GQD in (b) saline water, (c) UV-irradiation and (d) stability of GQD over wide range of temperature.

2. Histogram for average particle size (nm) from a TEM image (Scale: 10 nm)

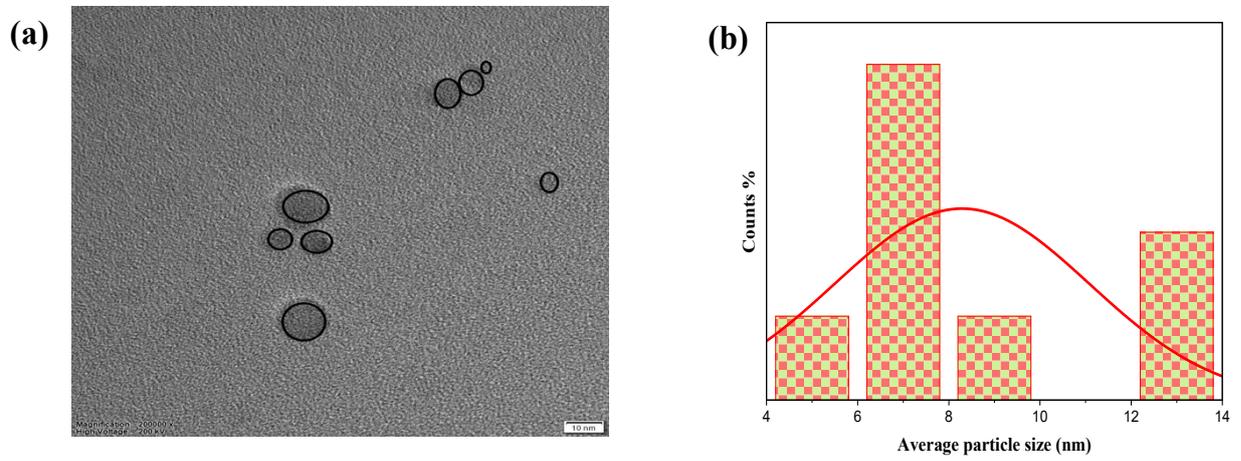


Figure S2. (a) TEM image of GQDs (Scale: 10 nm) (b) Histogram for average particle size (nm) measurement

3. PXRD pattern of Graphene oxide (GO), FTIR pattern of Graphene oxide (GO), FESEM image of GO, and EDAX analysis of GO

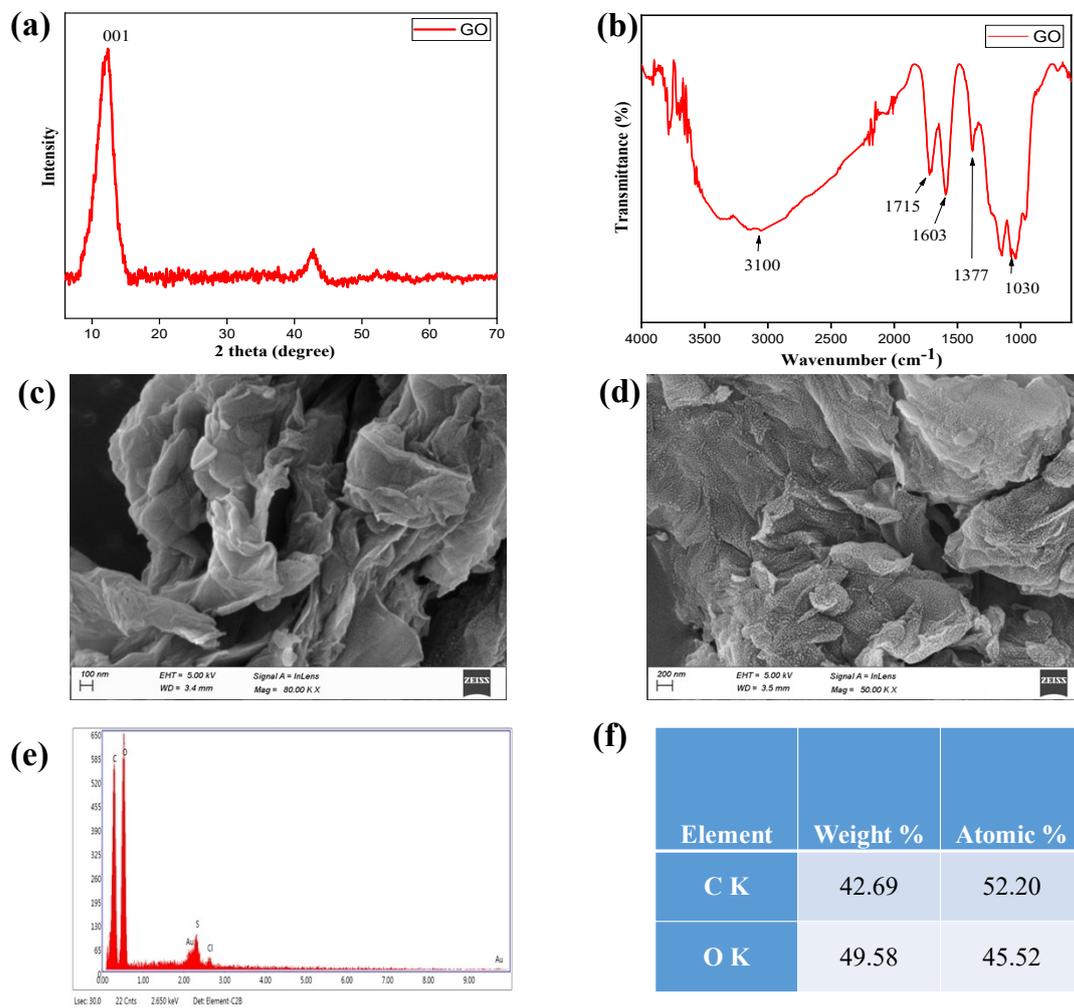


Figure S3: (a) PXRD pattern of GO, (b) FTIR of GO (c, d) FESEM image of synthesized GO, and (e) EDAX analysis of GO (f) Elemental weight% and atomic% in GO

4. Selectivity of GQDs for Picric acid (TNP) and Para-nitroaniline (PNA)

The selectivity of the GQDs toward their target analytes was systematically investigated in the presence of various potential interfering species. The tested interferents comprised aniline, 4-nitrobenzoic acid, benzoic acid, nitrobenzene, 3-aminobenzoic acid, 4-nitrophenol, benzene, p-nitroaniline, 2-nitrophenol, uric acid, and m-nitroaniline. As shown in Figure S4, the results clearly demonstrate that the GQDs effectively discriminate the target analytes from structurally related compounds. Notably, the GQDs exhibit pronounced and specific selectivity toward TNP and PNA, even in the presence of closely similar interfering molecules.

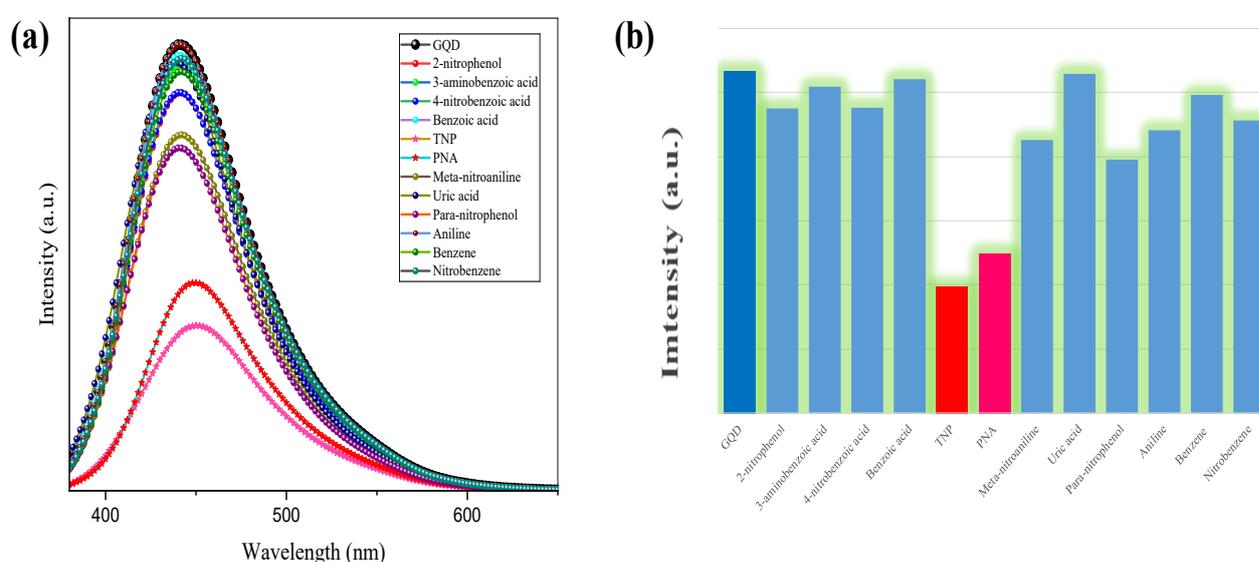


Figure S4: Selectivity of GQDs towards TNP and PNA over various common interfering species

5. Sample collection and preparation for the practical utility of GQDs

River water samples were collected from the Brahmaputra River in Guwahati, Assam. Soil samples were gathered from the Gauhati University campus in Guwahati, Assam. Water-laden samples were first passed through Whatman filter paper (pore size 125 mm) without any prior treatment. The soil samples were then air-dried and finely ground using a mortar and pestle. Approximately 8 grams of the processed soil were transferred to a beaker containing 40 mL of acetone and subjected to ultrasonication for 50 minutes. The resulting suspension was centrifuged at 8000 rpm for 30 minutes, after which the supernatant was collected. The remaining residue was re-dissolved in 30 mL of deionized water for further analysis.

6. Zeta potential measurements

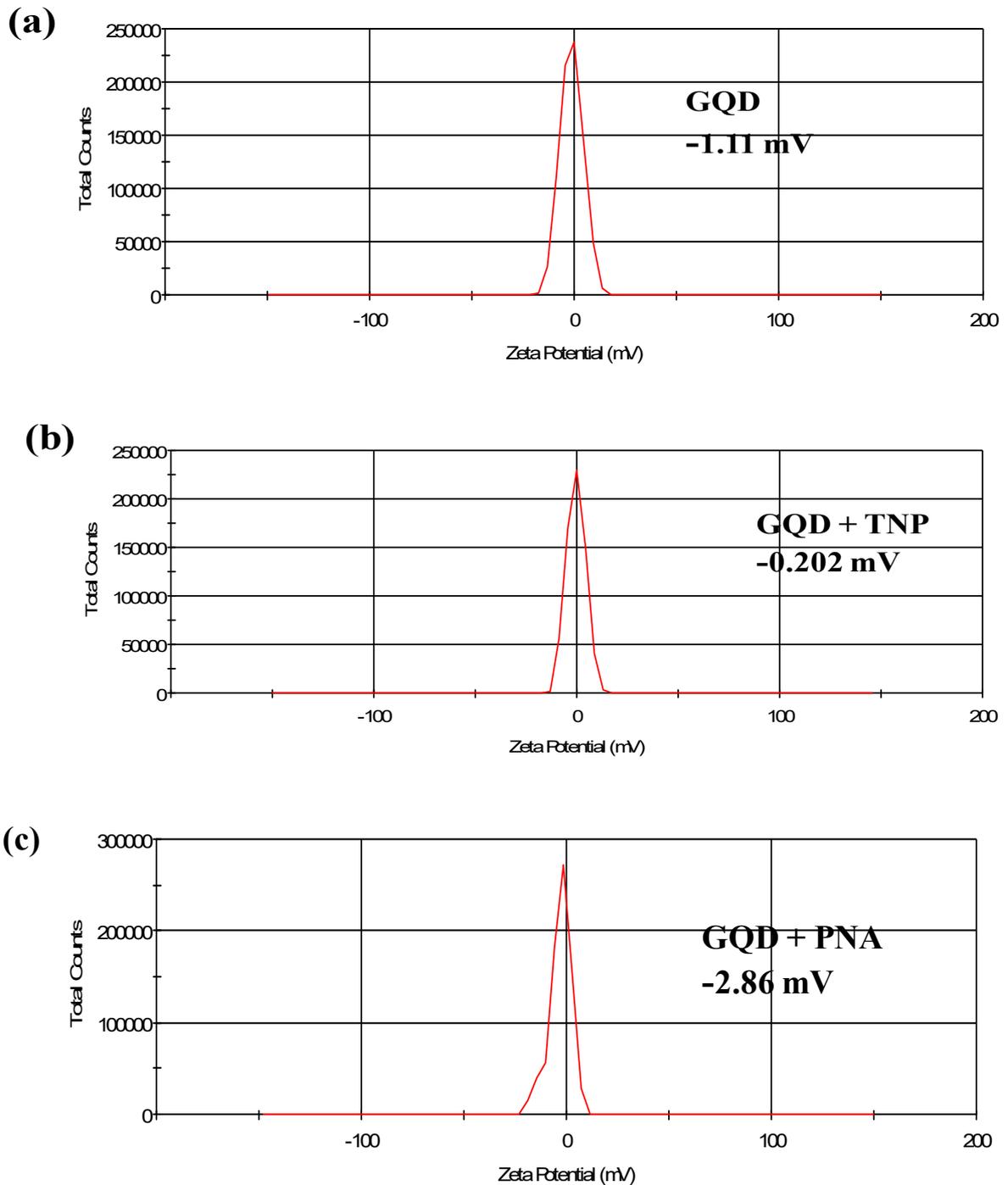


Figure S5: Zeta potential measurements of (a) GQD, (b) (GQD + TNP), and (c) (GQD + PNA) complex.

7. Data for recovery percentage and RSD%

Tables SF1: Analysing real samples for TNP in river water (RW) and soil sample (SS) along with the recovery percentage and RSD% at four concentrations

SL. no	TNP spiked/ (μM)	Found in RW/ (μM)	Recovery % in RW	RSD % (RW)	Found in SS/ (μM)	Recovery % in SS	RSD% (SS)
1	1.96	1.92	96.5	0.0027	1.89	96.42	0.8700
2	3.85	3.83	99.48	0.0032	3.80	98.70	0.7800
3	5.7	5.69	99.82	0.0082	5.66	99.29	0.9700
4	7.4	7.38	99.72	0.0020	7.36	99.45	0.8000

Table SF2: Analysing real samples for PNA in river water (RW) and soil sample (SS) along with the recovery percentage and RSD% at four concentrations

SL. no	PNA spiked/ (μM)	Found in RW/ (μM)	Recovery % in RW	RSD % (RW)	Found in SS/ (μM)	Recovery % in SS	RSD% (SS)
1	1.96	1.92	97.95	0.0470	1.91	97.44	0.0265
2	3.85	3.83	99.48	0.0250	3.82	99.22	0.0195
3	5.7	5.64	98.94	0.0201	5.67	99.47	0.0105
4	7.4	7.35	99.32	0.0124	7.36	99.45	0.0116

8. Various time-line photographs of GQDs on the study of nanophytotoxicity

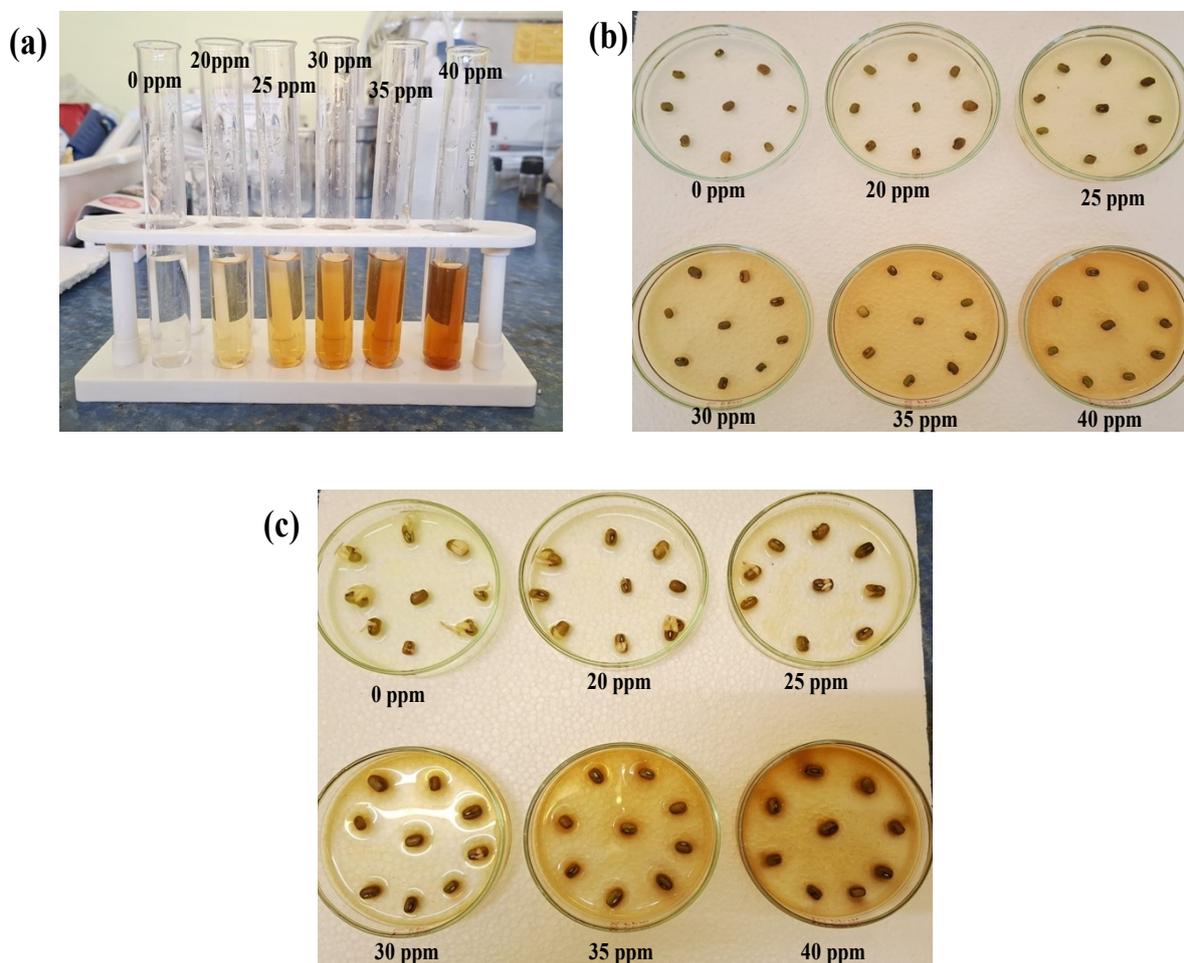


Figure S6: Digital photographs of (a) different concentration of GQDs, (b) initial plotting of plates with different concentration of GQDs, (c) inhibition of *Vigna radiata* L. seeds after 48 hours.

9. Over all decay plot

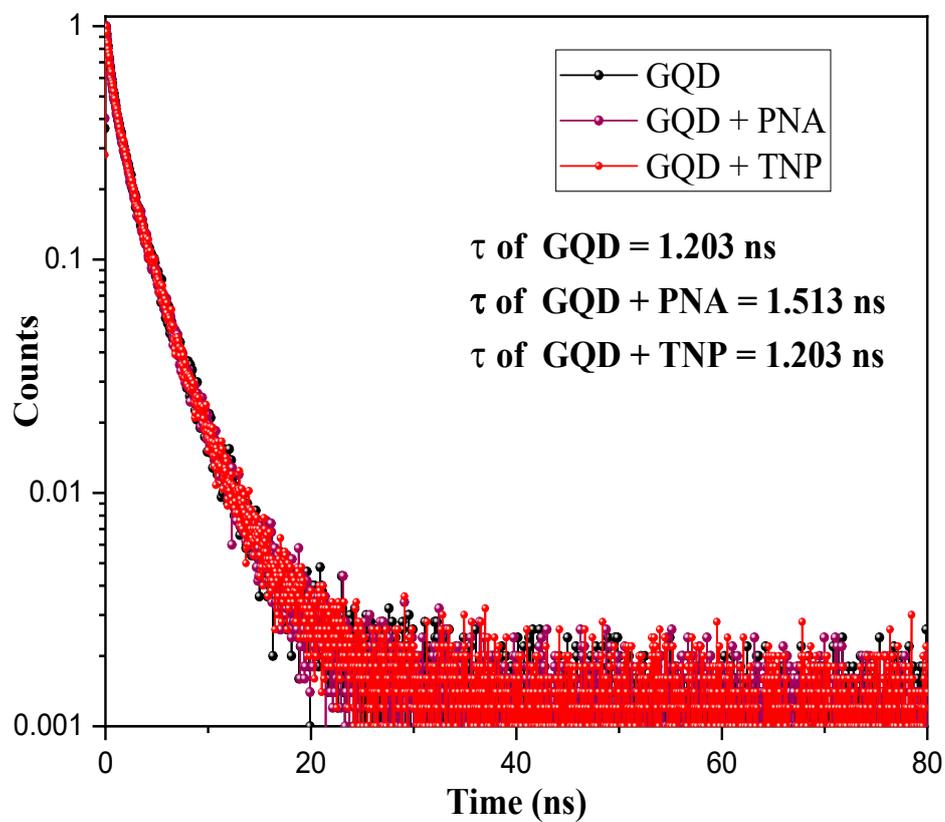


Figure S7: Decay plot of the sensor (GQD) with pollutant (GQD + PNA, GQD + TNP)

10. EDAX analysis

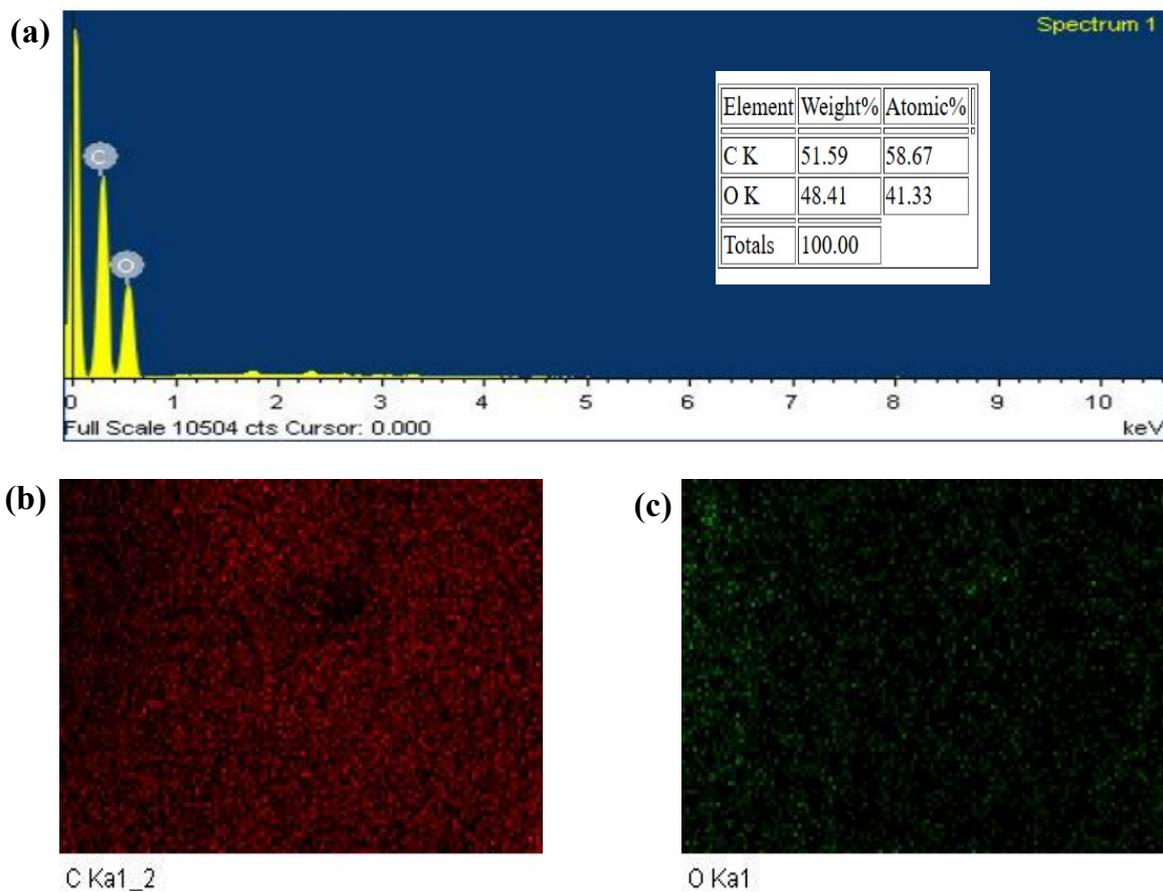


Figure S8: (a) EDAX analysis of GQD, (b) and (c) EDAX mapping of C and O respectively.