Supplementary Information (SI) for Environmental Science: Advances.

Supporting Information

Fluorescent Carbon Dots Embedded Silica Nanocomposites as Tracers for Hydrogeological Investigations; A Sustainable Approach

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Photographs of the carbon dots synthesized from glucose and ethylene diamine under different microwave irradiation timings are shown below in Figure S1.

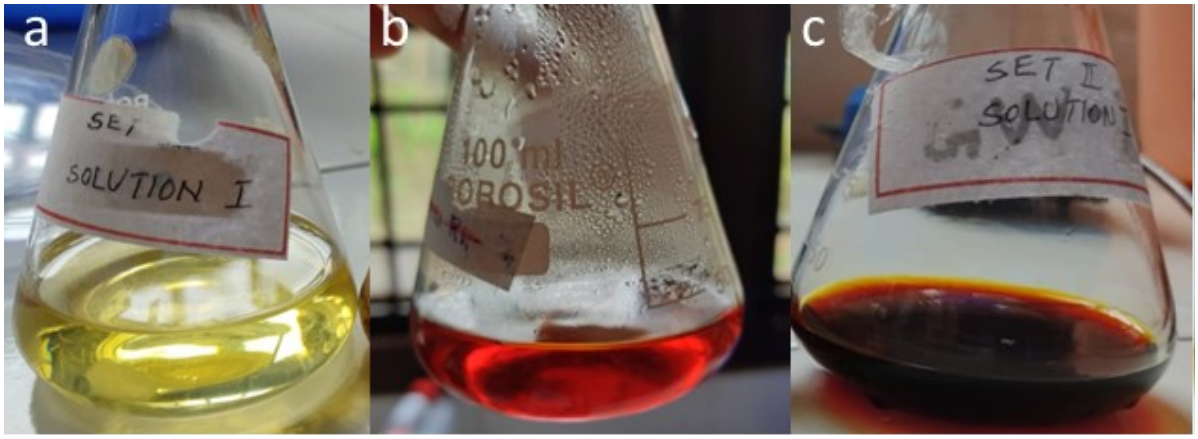

Figure S1. Photographs of the carbon dots synthesized from glucose and ethylene diamine in the ratio 1:1 and microwave treated for (a) 5 min (b) 12 min (c) 16 min.

Table S1 represents the lifetime of the as-synthesized carbon dots.

Table S1. Lifetime results of the carbon dots synthesized from glucose and ethylene diamine under varying conditions.

Sample Code	τ1(s)	τ2 (s)	τ3 (s)	Lifetime (ns)
C-dot 1:0.5-5 min	4.02E-09	8.76E-10	1.05E-08	5.28
C-dot 1:05-12 min	3.92E-09	8.10E-10	1.05E-08	6.17
C-dot 1:05-16 min	3.56E-09	8.32E-10	9.88E-09	5.48
C-dot 1:1-5min	4.28E-09	9.12E-10	1.18E-08	4.77
C-dot 1:1-12 min	3.67E-09	7.72E-10	9.93E-09	5.29
C-dot 1:1-16 min	5.50E-09	1.11E-08	1.13E-09	6.34
C-dot 1:2-5 min	1.05E-09	4.39E-09	1.62E-08	4.60

C-dot 1:2-12 min	3.41E-09	6.62E-10	9.65E-09	4.45
C-dot 1:2-16 min	4.02E-09	1.03E-09	9.24E-09	4.36

The zeta potential of the carbon dot solution was measured using Anton Paar Litesizer 500 equipment and the result is presented below in Figure S2.

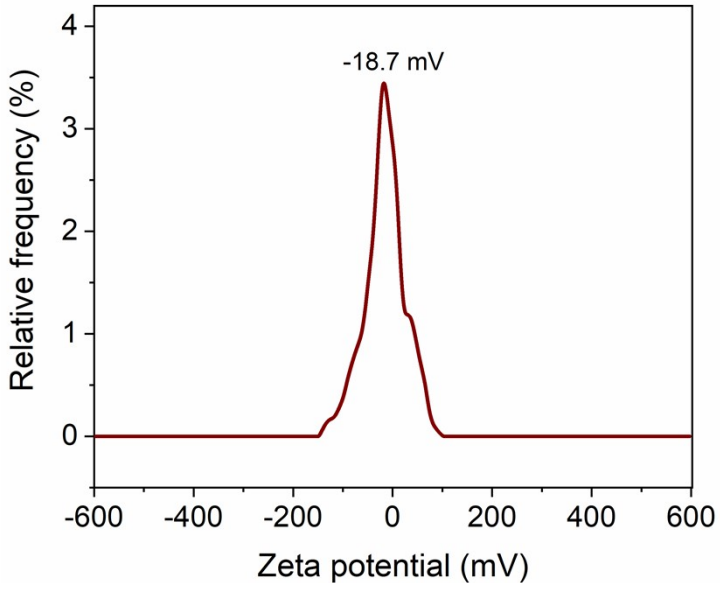

Figure S2. Zeta potential measurement of the synthesized carbon dots.

Figure S3. shows the photographs of the synthesized carbon dots and carbon dots embedded silica nanocomposites.

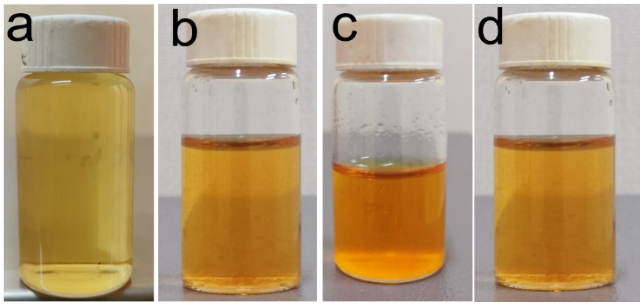

Figure S3. Photographs of the synthesized (a) carbon dots and carbon dots embedded silica nanocomposites (b) CD-SiO_2 1:0.05 (c) CD-SiO_2 1:0.1 and (d) CD-SiO_2 1:0.25.

PL decay curves for the carbon dot and carbon dot-embedded silica nanocomposites is given below in Figure S4.

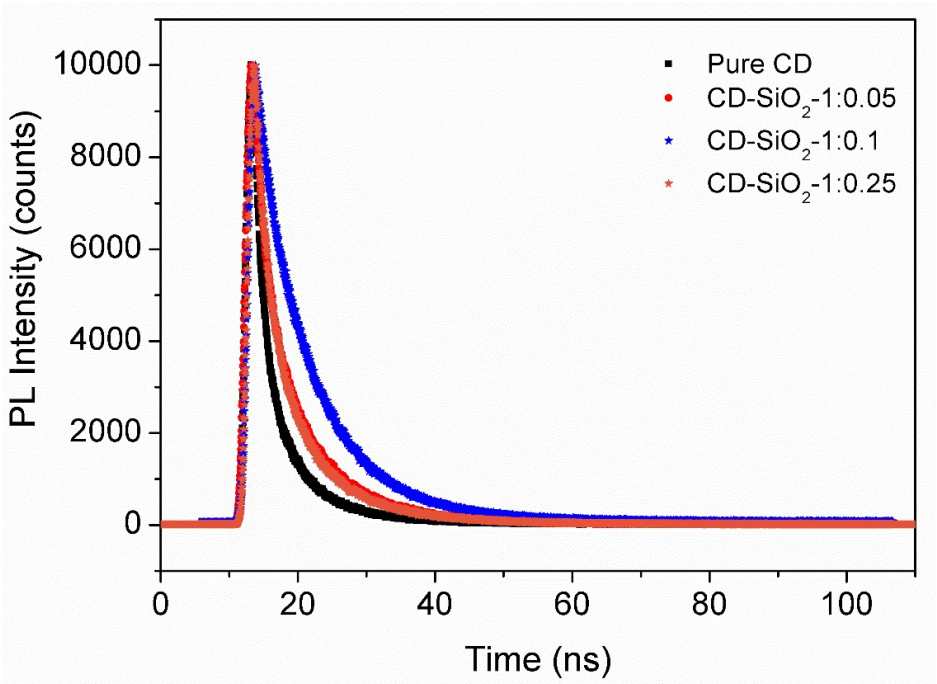

Figure S4. PL decay curves for the carbon dot and carbon dot embedded silica nanocomposites.

The soil and sand used for column study are characterized for their pH, electrical conductivity, organic carbon, sodium, and potassium using standard methods available in the literature and the results are presented below in Table S2.

Table S2. Physico-chemical characteristics of the soil and sand used in the column study.

Sample	pH (soil:water 1:2)	Electrical conductivity (µS/cm) (soil:water 1:2)	Organic Carbon (%)	Organic Matter (%)	Sodium (mg/L)	Potassium (mg/L)
Soil	4.9	37.4	3.31	4.80	2.25	17.5
Sand	6.62	213	0.33	0.57	15.67	0.33

The relatively high values for the electrical conductivity and sodium content in sand was noticed which is attributed to the fact that the very fine beach sand collected locally was used for the column study.