Supplementary information

A comprehensive estimate of the aggregation and transport of $nSiO_2$ in static and dynamic aqueous systems

Figures:

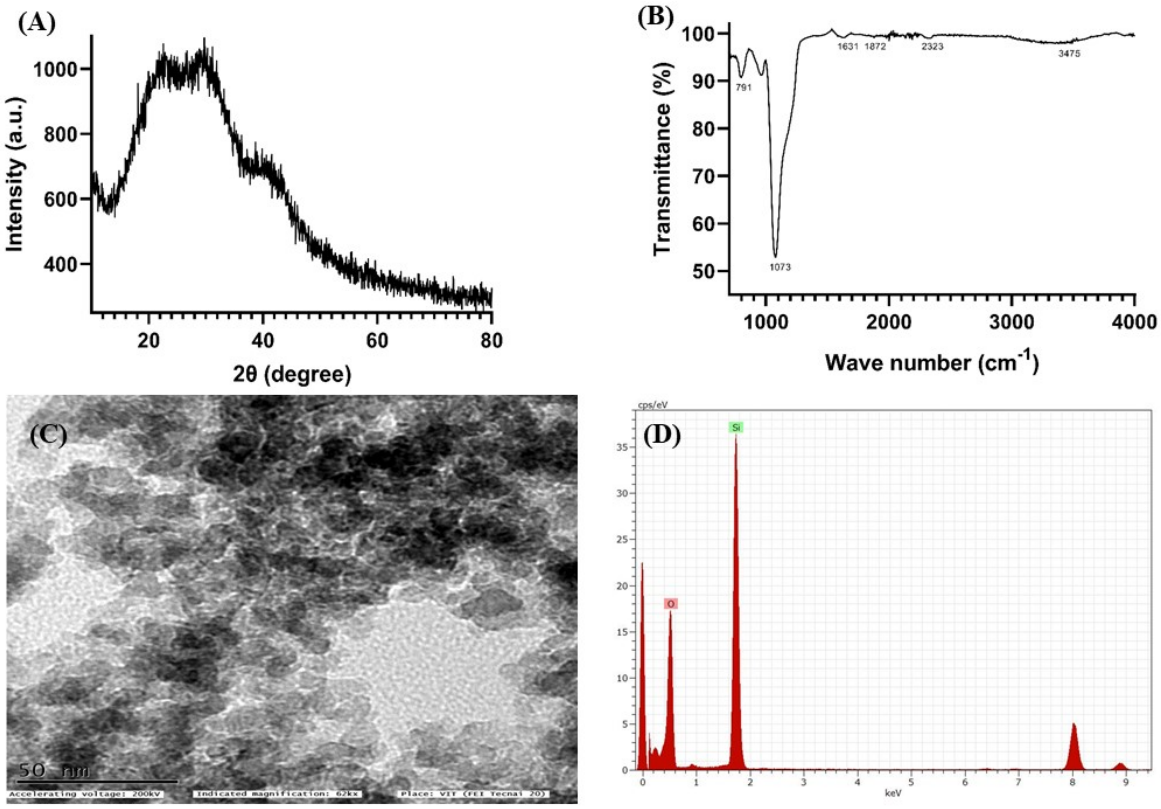

Figure S1: (A)XRD analysis of $nSiO_2$ (B) FTIR analysis of $nSiO_2$ (C) Transmission Electron microscopic image of $nSiO_2$ dispersed in Milli-Q water (D) and the corresponding EDX spectra

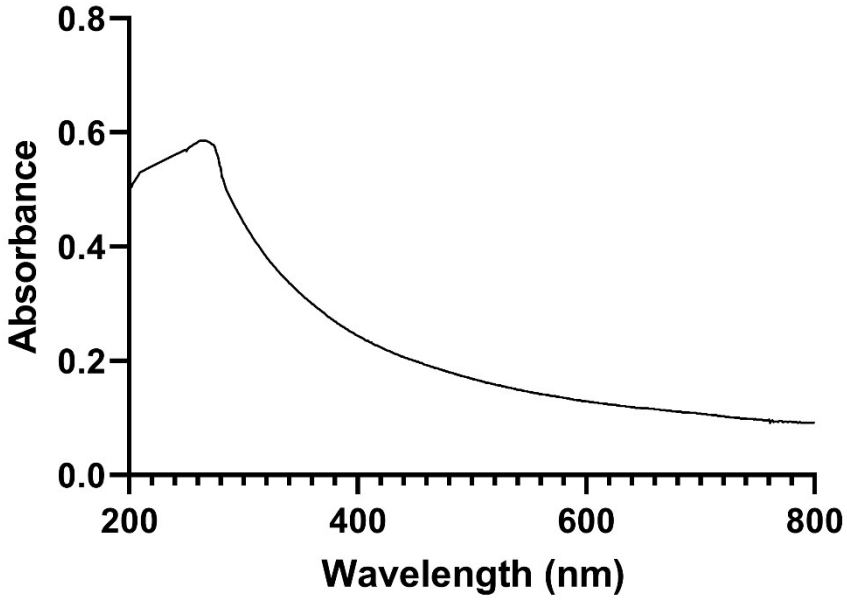

Figure S2: UV visible spectroscopic image of $nSiO_2$

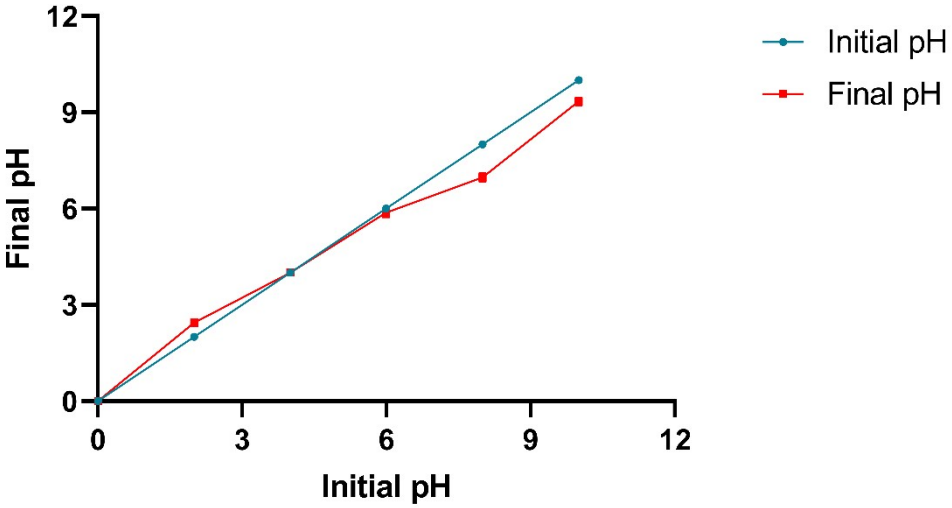

Figure S3: Isoelectric point of $nSiO_2$

Table S1: Physiochemical characteristics of different environmental water samples

Water Source	pH	TDS (mg/L)	Ionic strength (mM)	Electrical conductivity (µS cm^{-1})	Total Organic Carbon (mg/L)
River	8.7 ± 0.070	660 ± 1.768	11.93 ± 0.017	938.20 ± 0.035	106.3 ± 0.424
Lake	6.5 ± 0.070	1170 ± 0.707	24.54 ± 0.339	1933 ± 0.353	40.10 ± 0.424
Tap	7.7 ± 0.070	158 ± 0.353	2.85 ± 0.053	224.80 ± 0.318	0.88 ± 0.010
Ground	7.5 ± 0.106	2570 ± 0.353	60 ± 0.353	4721 ± 707	2.67 ± 0.003

Table S2: Effective diameter and surface (zeta) potential of $nSiO_2$ in colloidal suspension in absence of shear force; IS: Ionic strength; HA: Humic acid

Sl No.	Parameter	Effective Diameter (nm)	Zeta potential (mV)
1	pH 5	1825	-5.12
2	pH 7	355	-21.63
3	pH 9	321	-22.17
4	IS 10 mM	410	-20.98
5	IS 50 mM	445	-21.38
6	IS 100 mM	1164	-8.63
7	HA 0.1 mg/L	278	-41
8	HA 1 mg/L	255	-42.65

9	HA 10 mg/L	214	-46.40
10	IS 10 + HA 0.1	441	-22.61
11	IS 10 + HA 1	384	-22.81
12	IS 10 + HA 10	297	-31.86
13	IS 50 + HA 0.1	542	-17.51
14	IS 50 + HA 1	427	-20.68
15	IS 50 + HA 10	342	-29.94
16	IS 100 + HA 0.1	842	-14.18
17	IS 100 + HA 1	612	-16.39
18	IS 100 + HA 10	478	-23.19
19	River water	584	-20.49
20	Lake water	507	-21.74
21	Ground water	1527	-10.72
22	Tap water	364	-27.64

Table S3: Effective diameter and surface (zeta) potential of $nSiO_2$ in colloidal suspension in presence of shear forces (100 and 400 rpm); IS: Ionic strength; HA: Humic acid

Sl No.	Parameter	Effective Diameter (nm)		Zeta potential (mV)	
		RPM 100	RPM 400	RPM 100	RPM 400
1	pH 5	874	798	-9.23	-8.73
2	pH 7	296	281	-31.66	-34.56
3	pH 9	284	263	-32.19	-33.98
4	IS 10 mM	507	496	-21.79	-20.06

5	IS 50 mM	514	501	-19.05	-18.83
6	IS 100 mM	545	511	-11.14	-12.01
7	HA 0.1 mg/L	315	323	-35.94	-37.83
8	HA 1 mg/L	282	291	-38.28	-41.46
9	HA 10 mg/L	267	254	-41.09	-43.40
10	IS 10 + HA 0.1	342	263	-32.01	-32.31
11	IS 10 + HA 1	330	241	-35.16	-36.74
12	IS 10 + HA 10	318	211	-39.14	-40.12
13	IS 50 + HA 0.1	514	489	-18.80	-17.88
14	IS 50 + HA 1	444	463	-24.45	-24.87
15	IS 50 + HA 10	432	407	-29.99	-31.01
16	IS 100 + HA 0.1	624	587	-14.49	-14.75
17	IS 100 + HA 1	463	479	-19.00	-17.95
18	IS 100 + HA 10	451	435	-21.81	-21.72
19	River water	365	356	-27.63	-26.89
20	Lake water	399	390	-26.69	-23.72
21	Ground water	872	764	-11.29	-12.01
22	Tap water	425	401	-26.79	-27.74

Table S4: DLVO interaction energy profiles for the $nSiO_2$-$nSiO_2$ interaction in the presence of different pH, IS: Ionic strength; HA: Humic acid in absence of shear force. Measurements of depths of primary minima (Φ_{min}), heights of energy barriers (Φ_{max}) and depths of secondary wells (Φ_{sec}) for the DLVO energy profiles

Sl No.	Background Chemistry	Φ_{max}	Φ_{min}	Φ_{sec}
1	pH 5	-1.175E-18	-9.6E-17	-

2	pH 7	1.852E-18	-1.36E-17	-
3	pH 9	1.805E-18	-1.20E-17	-
4	IS 10 mM	-1.952E-18	-1.61E-17	-
5	IS 50 mM	2.241E-18	-1.72E-17	-
6	IS 100 mM	1.084E-19	-6.09E-17	-
7	HA 0.1 mg/L	9.152E-18	1.66E-18	-
8	HA 1 mg/L	9.323E-18	2.85E-18	-
9	HA 10 mg/L	9.908E-18	5.16E-18	-
10	IS 10 + HA 0.1	2.635E-18	-1.62E-17	-
11	IS 10 + HA 1	2.362E-18	1.40E-17	-
12	IS 10 + HA 10	4.823E-18	-5.56E-18	-
13	IS 50 + HA 0.1	1.448E-18	-2.39E-17	-
14	IS 50 + HA 1	1.939E-18	-1.70E-17	-
15	IS 50 + HA 10	4.671E-18	-7.90E-18	-
16	IS 100 + HA 0.1	1.081E-18	-4.03E-17	-
17	IS 100 + HA 1	1.310E-18	-2.78E-17	-
18	IS 100 + HA 10	3.090E-18	-1.72E-17	-
19	River water	2.584E-18	-234E-17	-
20	Lake water	2.688E-18	-1.94E-17	-
21	Ground water	6.243E-19	-7.77E-17	-
22	Tap water	3.950E-18	-1.01E-17	-