Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

Synthesis of Alumina-based Cross-Linked Chitosan-HPMC Biocomposite Film: An Efficient and User-friendly Adsorbent for Multipurpose Water Purification

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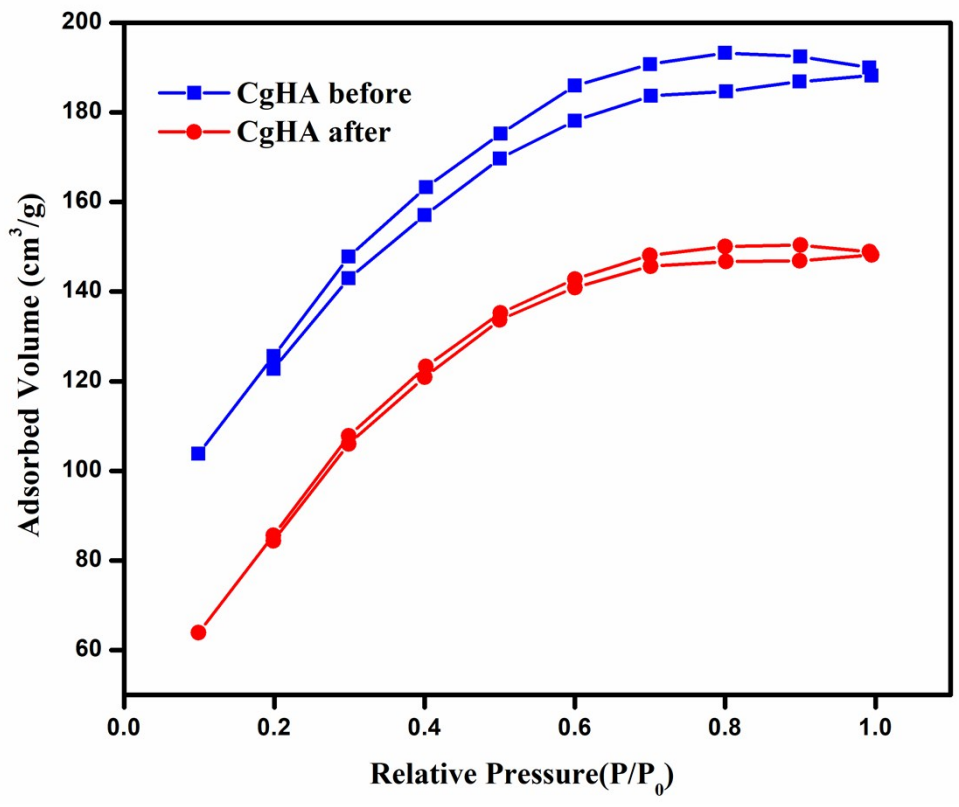

Fig. S1. N_2 adsorption-desorption isotherm of CgHA before and after fluoride adsorption.

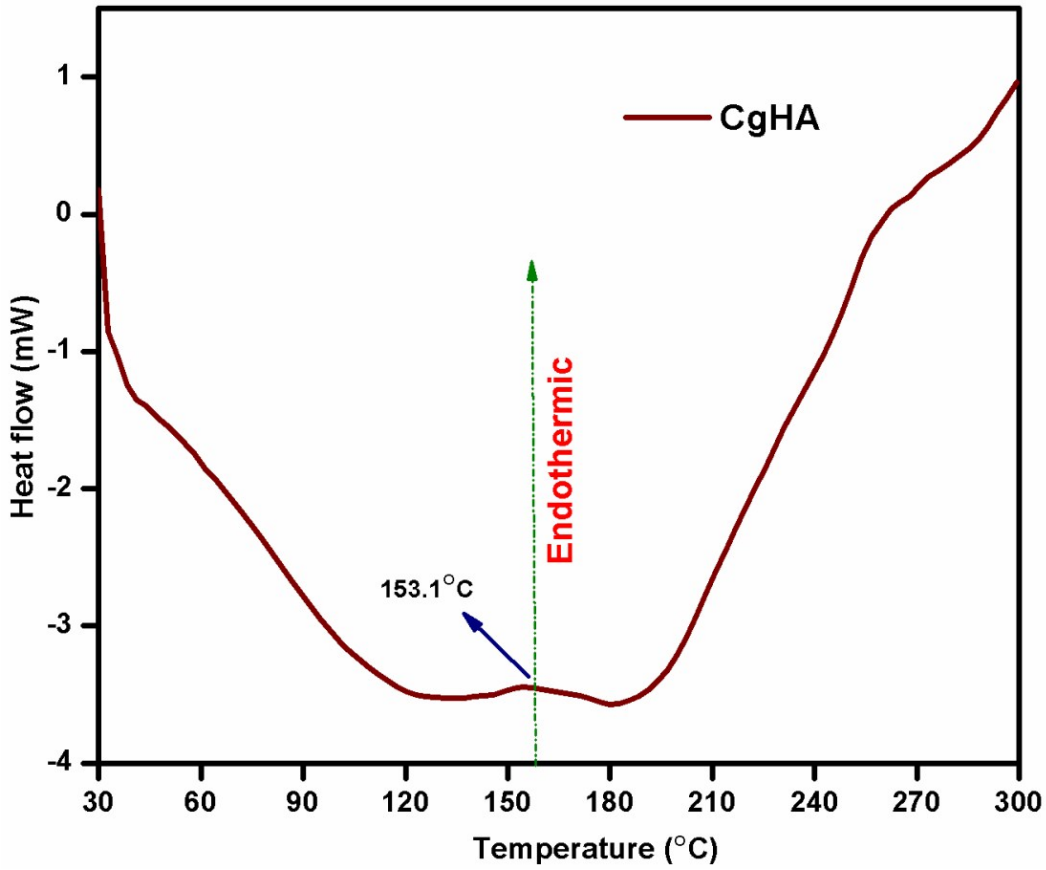

Figure S2.DSC study of CgHA.

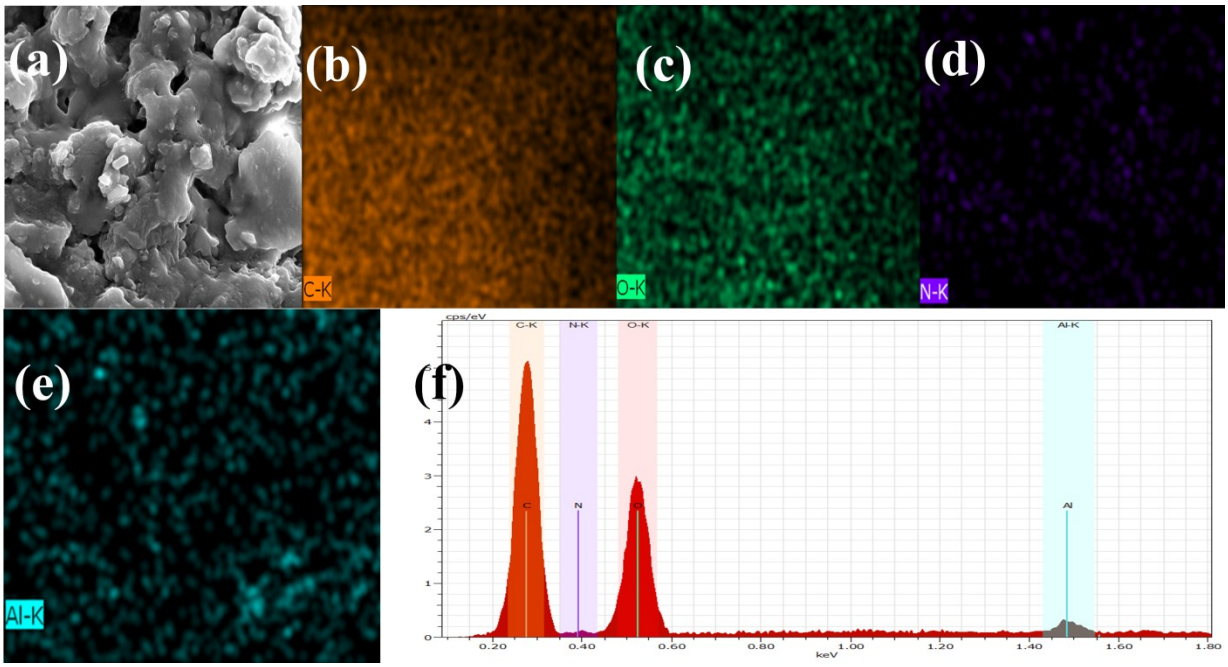

Fig. S3 FESEM images of CgHA (a) EDX mapping of C (b), O (c), N (d), and Al (e) and EDS mapping of CgHA sample (f).

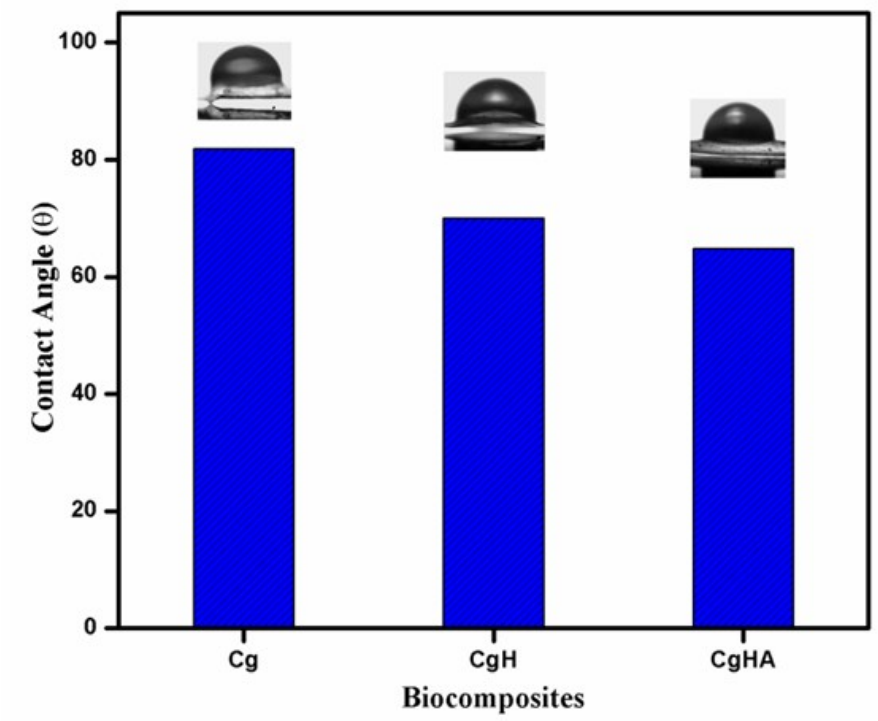

Figure S4. Contact angle study for Cg, CgH, and CgHA biocomposite films.

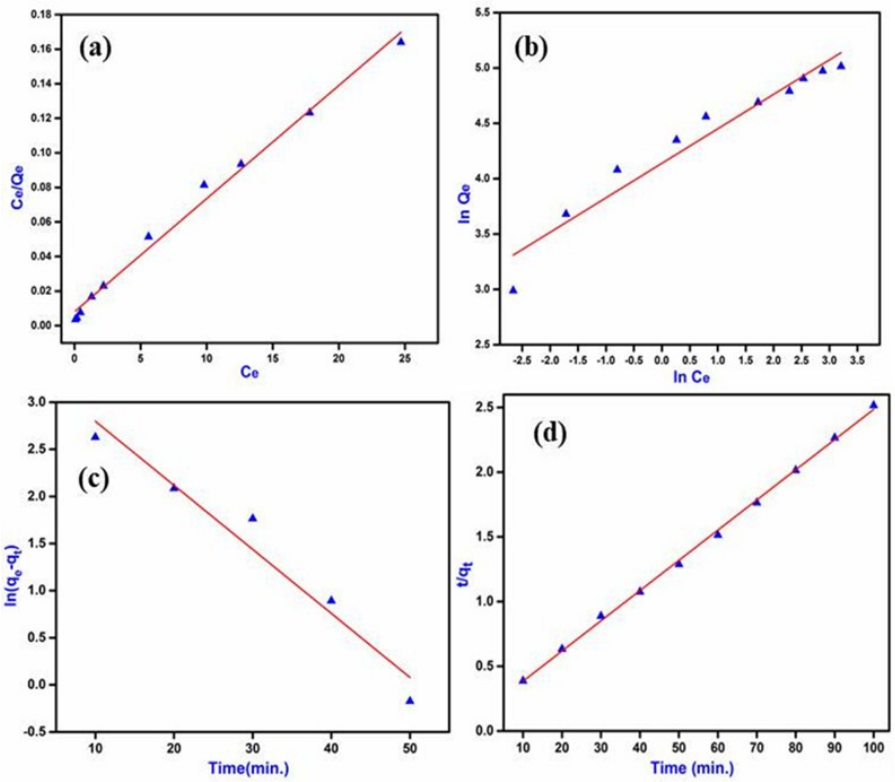

Figure S5. Langmuir adsorption Isotherm (a), Freundlich adsorption Isotherm (b) pseudo 1st order kinetic model (c), and pseudo second order kinetic model (d).

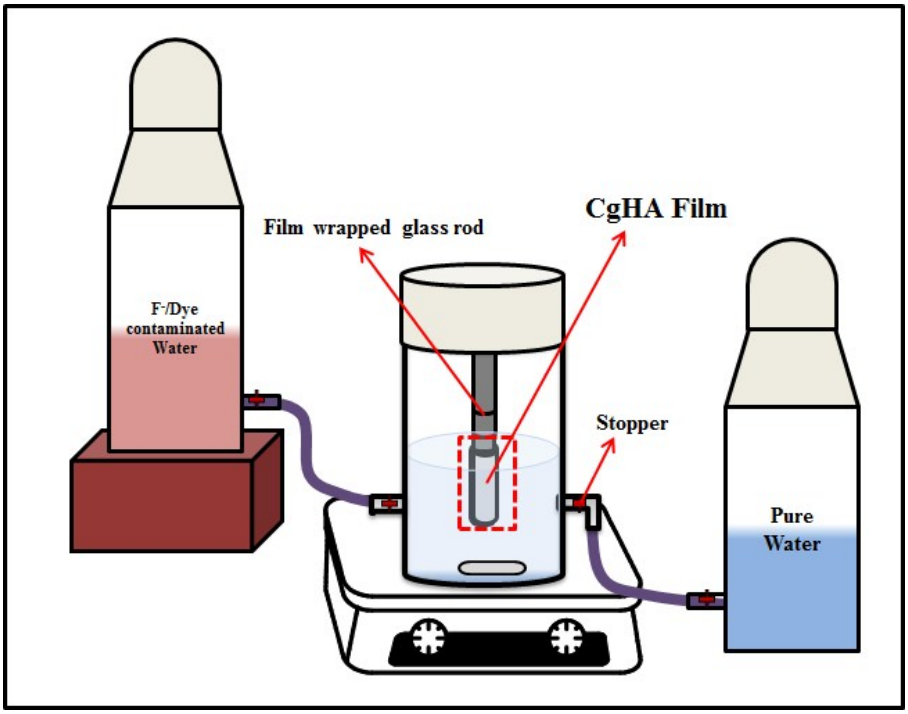

Figure S6. Novel experimental setup for adsorption and separation of water contaminants with CgHA biocomposite film.

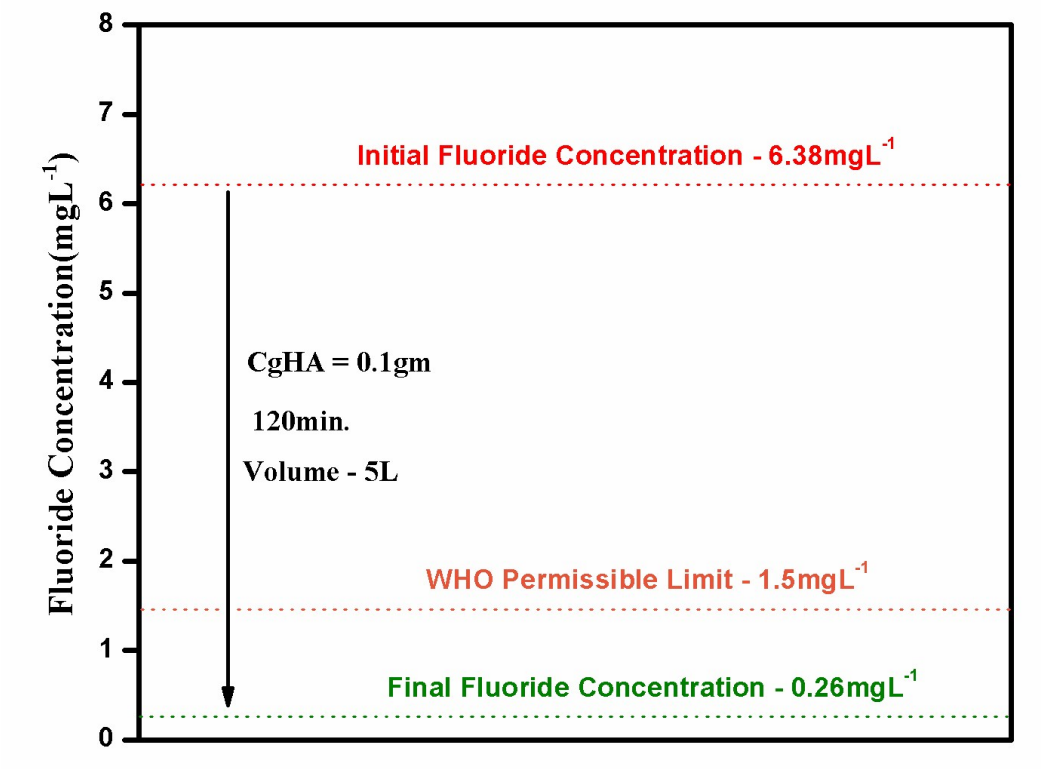

Figure S7. Defluoridation experiment with real groundwater with CgHA biocomposite film.

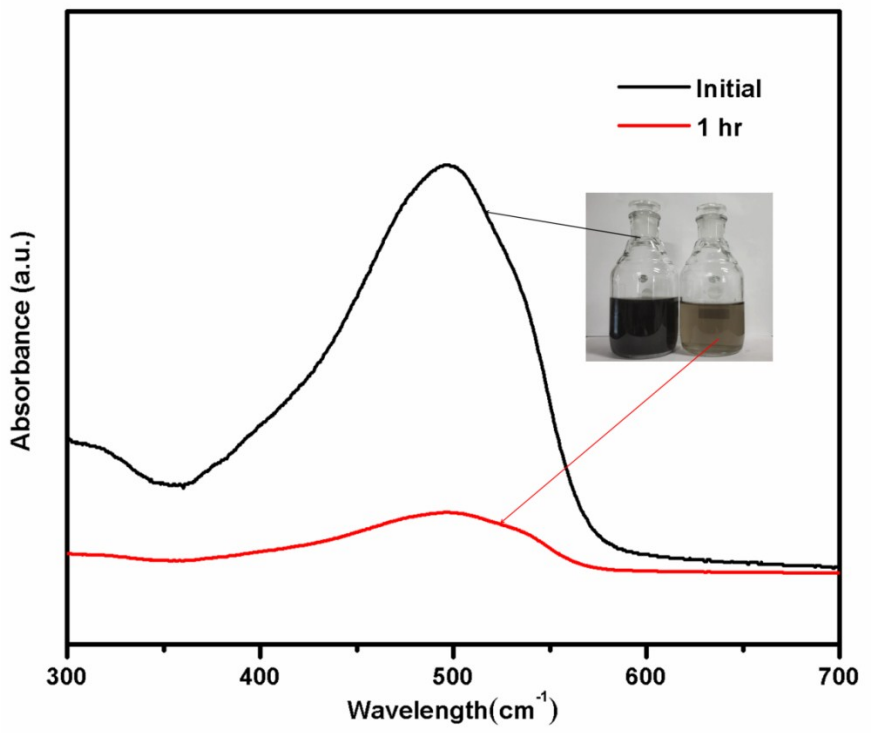

Figure S8. UV-Vis study with real textile wastewater with CgHA biocomposite film.

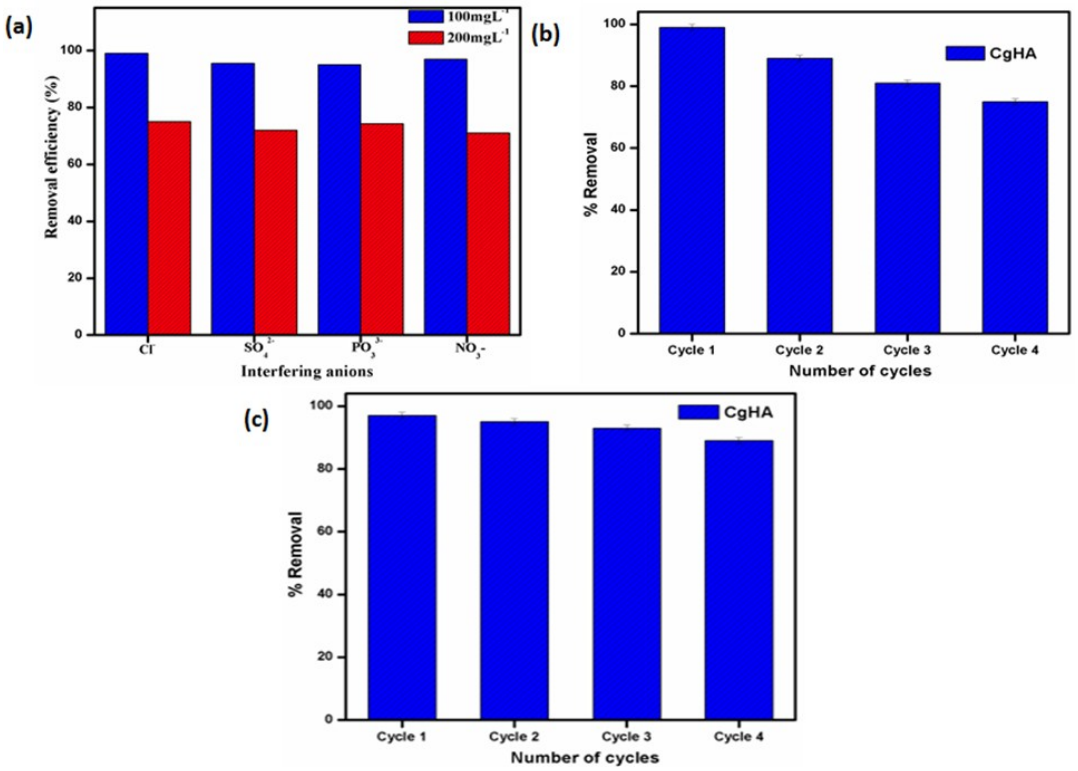

Figure S9. Interfering anion test (a), reusability study for Fluoride ion (b) and MO dye (c) with CgHA biocomposite film.

Table S1. Dissolution test and swelling percentage ratio of each biocomposite film

Biocomposite	5% acetic acid		Distilled water		0.1M NaoH	
Cg	Insoluble	18.6	Insoluble	13.8	Insoluble	10.3
CgH	Insoluble	12.1	Insoluble	9.4	Insoluble	7.8
CgHA	Insoluble	4.2	Insoluble	3.1	Insoluble	1.8

Table S2. Alumina leaching test.

Sl. NO.	Time(hrs.)	Alumina leaching (mg/L)
1	1	BDL*
2	6	BDL
3	12	0.603

4	18	0.917
5	24	1.072

*BDL = Below Detection Level

Table S3. Defluoridation efficiency with very high concentrated fluoride solution.

Sl. NO.	Time(hrs.)	150 mg/L initial F^- Conc.	200 mg/L initial F^- Conc.	Q_e (mg/g)	
		Final concentration		150 mg/L initial F^- Conc.	200 mg/L initial F^- Conc.
1	1	51.43	75.8	197.1	248.4
2	6	42.67	64.56	214.6	270.8
3	12	35.89	57.1	228.2	285.8
4	18	28.11	51.77	243.7	296.4
5	24	26.74	49.8	246.5	300.4

Table S4. Real ground water defluoridation test.

Sl. No.	State	District (India)	Village	pH	TDS (ppm)	EC (µS/cm)	ORP (mV)	Temp. (˚C)	Salinity (psu)	DO (ppm)	F_I (ppm)	F_F (ppm)
1	Odisha	Bolangir	Ganda Pali	6.4	657	947	59.9	29.3	0.52	6.5	1.32	BDL*
2	Odisha	Bolangir	Bhatipala	6.98	351	541	-107.4	28.6	0.23	5.29	6.38	0.17
3	Odisha	Bolangir	Barkani	6.9	67	104	53.3	29.5	0.04	6.78	1.45	0.11
4	Odisha	Bargarh	Barahahoda	7.3	826	1293	-44.2	30	0.59	5.42	1.55	0.15
5	Odisha	Bargarh	Garvare	7.6	278	436	-5.9	28.8	0.13	7.19	0.73	BDL
6	Odisha	Bargarh	Dunguripali	7.3	241	371	1.4	30.1	0.12	6.3	0.13	BDL
7	Odisha	Sonepur	Binika	6.9	184	291	-50.1	30.9	0.08	6.28	0.05	BDL
8	Odisha	Sonepur	Kanapali	6.9	112	173	-30.1	26.2	0.05	7.12	0.29	BDL

9	Odisha	Nuapada	Tanbod	6.7	200	310	55.9	27.1	0.1	6.64	0.2	BDL
10	Odisha	Nuapada	Bhaysar	6.69	647	1003	-79.2	30.5	0.42	5.77	0.11	BDL

*F_I = initial fluoride conc. *F_F = final fluoride concentration *BDL = Below Detection Level

Table – S5 BET surface area analysis.

Composite	**Surface Area(m^2g^{-1})**	**Pore Diameter (nm)**	**Total Pore Volume (cm^3g^{-1})**
CgHA before F^- adsorption	56	10.4	0.156
CgHA after F^- adsorption	20	7.1	0.101