Journal of the Serbian Chemical Society
JSCS@tmf.bg.ac.rs • www.shd.org.rs/JSCS
J. Serb. Chem. Soc. 89 (4) S182–S185 (2024) *Supplementary material*

SUPPLEMENTARY MATERIAL TO

Defluoridation using pinecone-based activated carbon: Adsorption isotherm, kinetics, regeneration and co-ions effect investigation

PARIMAL CHANDRA BHOMICK[1,2]*, AOLA SUPONG[2,3], AKITO I. SEMA[4] and DIPAK SINHA[2]

[1]*Department of Chemistry, St Joseph University, Chumoukedima, Nagaland, 79115, India,* [2]*Department of Chemistry, Nagaland University, Lumami, Nagaland, 798627, India,* [3]*Department of Chemistry Sao Chang College, Tuensang, Nagaland, 798612, India and* [4]*Department of Chemistry, National Institute of Technology, Nagaland, 797103, India*

J. Serb. Chem. Soc. 89 (4) (2024) 565–580

Zero-Point Charge of PAC

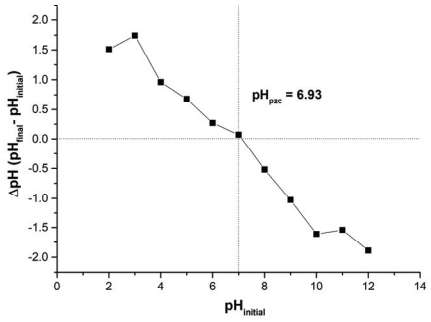
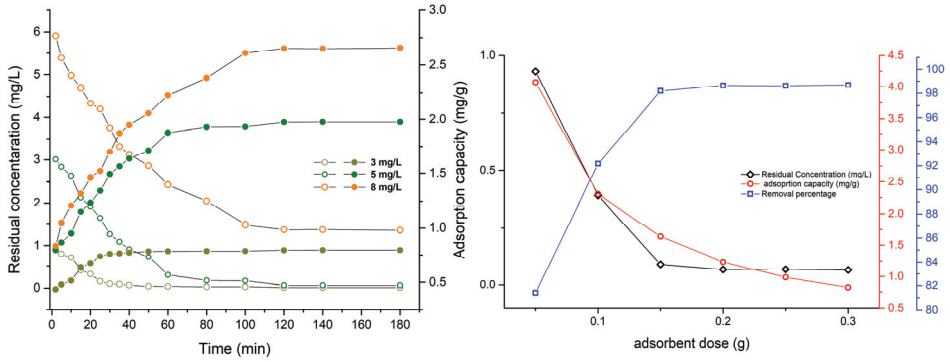


Figure S-1. Zero-point charge of Pc-AC

* Corresponding author. E-mail: paribhomick15589@gmail.com

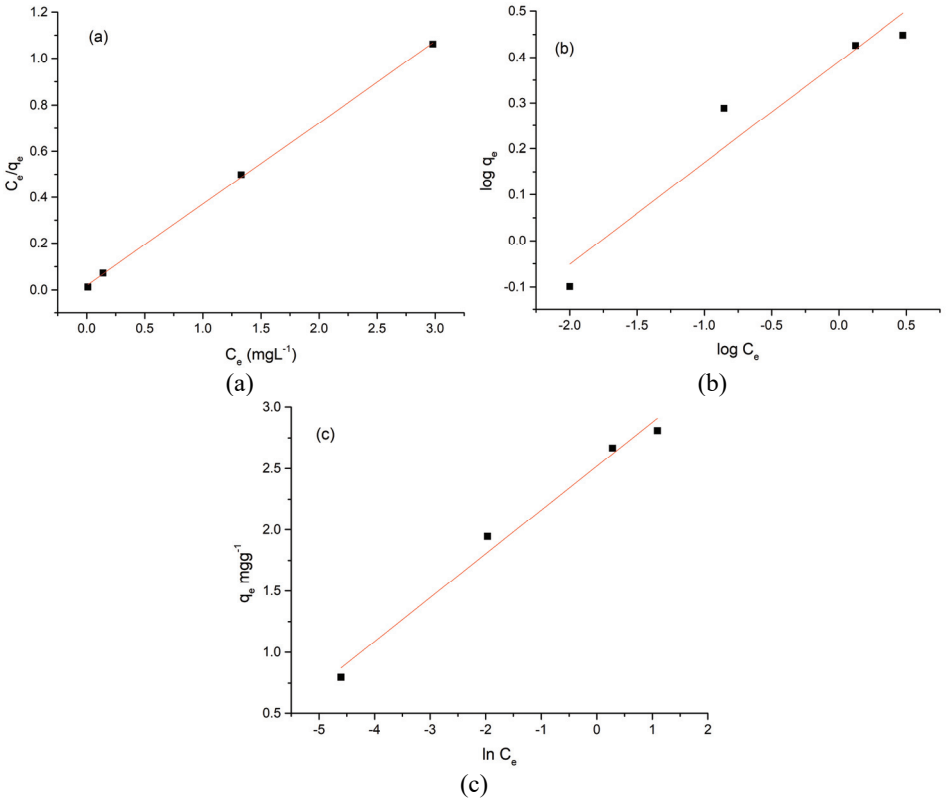
Adsorption results



(a) (b)

Fig S-2. (a) Contact time on adsorption capacity and residual concentration (b) adsorbent dose on adsorption capacity and residual concentration

Adsorption Isotherm



(a) (b) (c)

Figure S-3. (a) Langmuir (b) Freundlich (c) Temkin adsorption isotherm model for adsorption of fluoride onto Pc-AC

Adsorption Kinetics

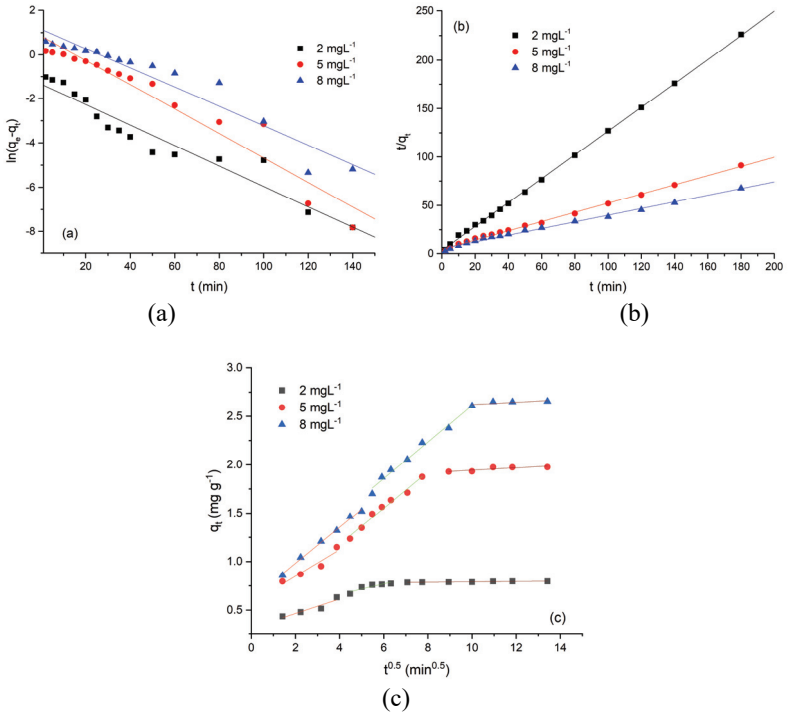


Fig. S-4. Fits of (a) pseudo-first order kinetics for Pc-AC (b) pseudo-second order kinetics (c) intraparticle diffusion model for adsorption of fluoride on Pc-AC

Comparison of Pc-AC with other adsorbents

The fluoride adsorption efficiency for the prepared activated carbon was compared with other adsorbents reported in the literature and is listed in Table S-I.

To determine the efficiency of Pc-AC, the maximum adsorption capacity (Q_{max}) was considered as the appropriate parameter for the comparison of different adsorbents with the present study. It is evident the defluoridation capacity of Pc-AC was comparable with other adsorbents and thus may be considered a suitable adsorbent for fluoride adsorption from water. Work is ongoing to study how the doping of metal ions into Pc-AC will affect the adsorption efficiency of fluoride and what would be the cost related to the incorporation of metal ions into the adsorbent.

Table S-I. Comparison of pinecone activated carbons with some other adsorbents for fluoride removal

Adsorbent	Dose (g)	pH	CT (min)	Conc. (mgL^{-1})	Isotherm	Q_{max} (mg g^{-1})	References
Catha edulis Activated carbon	1.5	2	60	30	Freundlich	18	[1]
$CaCl_2$-modified *Crocus sativus* leaves activated carbon	15	4.5	70	6.5	Langmuir	2.01	[2]
Bael (*Aegle Marmelos*) Shell Activated Carbon	2	6	60	8	--	2.4	[3]
Morinda tinctorial activated carbon coated with aluminium hydroxide	0.1	7	60	10	Langmuir	26.03	[4]
Schima wallichii activated carbon	1.15	4	100	5	Langmuir	2.524	[5]
Activated cotton nutshells carbon	1.75	7	180	3	Freundlich	2.472	[6]
Jamun seed activated carbon	0.4	2.5	120	10	Dubinin-Radushkevich	3.65	[7]
Pinecone activated carbon	1.5	4	120	5	Langmuir	2.845	**Present Study**

REFERENCES

1. J. Fito, H. Said, S. Feleke, A. Worku, *Environ. Syst. Res.* **8** (2019) 1–10 (https://doi.org/10.1186/s40068-019-0153-1)
2. M. H. Dehghani, M. Farhang, M. Alimohammadi, M. Afsharnia, G. Mckay, *Chem. Eng. Commun.* **205** (2018) 955–965 (https://doi.org/10.1080/00986445.2018.1423969)
3. K. Singh, D. H. Lataye, K. L. Wasewar, *J. Fluor. Chem.* **194** (2017) 23–32 (https://doi.org/10.1016/j.jfluchem.2016.12.009)
4. A. Amalraj, A. Pius, *Appl. Water Sci.* **7** (2017) 2653–2665 (https://doi.org/10.1007/s13201-016-0479-z)
5. P. C. Bhomick, A. Supong, R. Karmaker, M. Baruah, C. Pongener, D. Sinha, *Korean J. Chem. Eng.* **36** (2019) 551–562 (https://doi.org/10.1007/s11814-019-0234-x)
6. R. Mariappan, R. Vairamuthu, A. Ganapathy, *Chinese J. Chem. Eng.* **23** (2015) 710–721 (https://doi.org/10.1016/j.cjche.2014.05.019)
7. R. Araga, S. Soni, C. S. Sharma, *J. Environ. Chem. Eng.* **5** (2017) 5608–5616 (https://doi.org/10.1016/j.jece.2017.10.023).