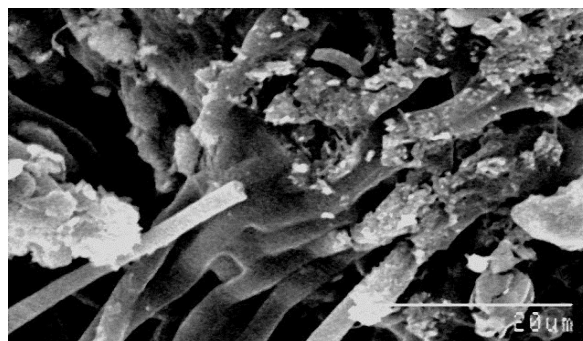


Supplementary file:



a



b

Fig. S1: SEM images of inactivated Bio-mass (a) Bio-mass (b) Bio-mass loaded with F^-

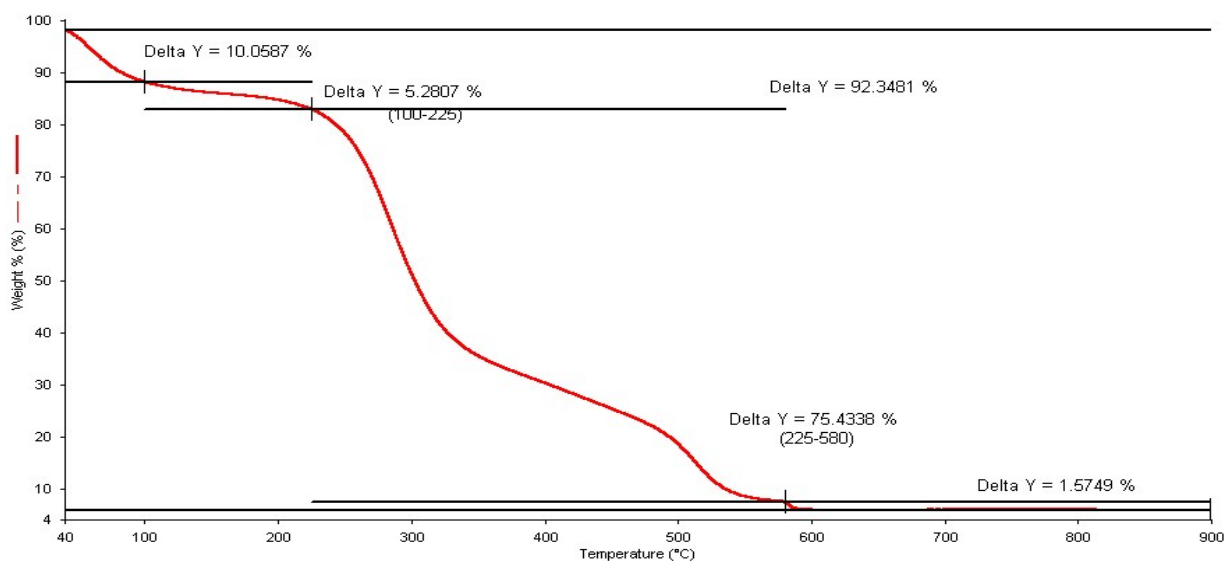
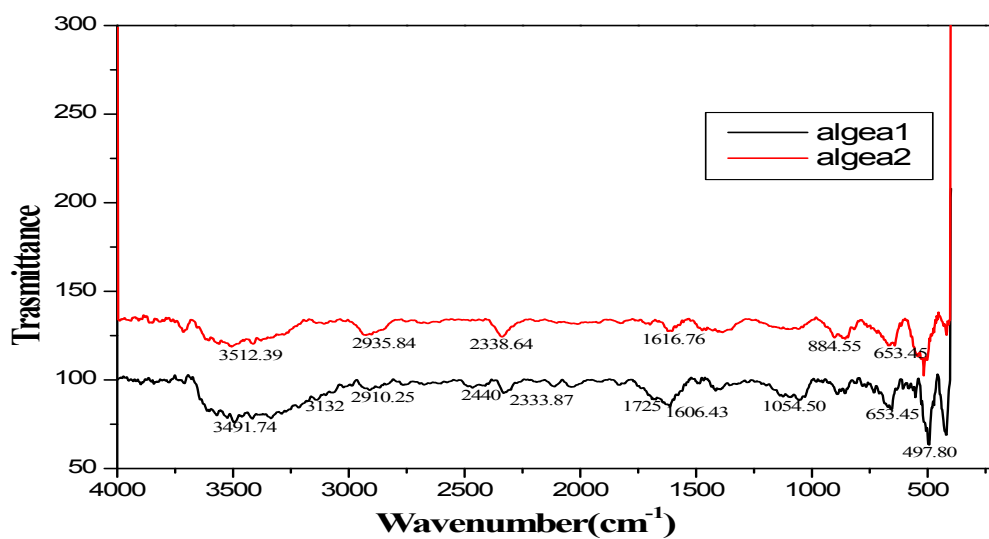
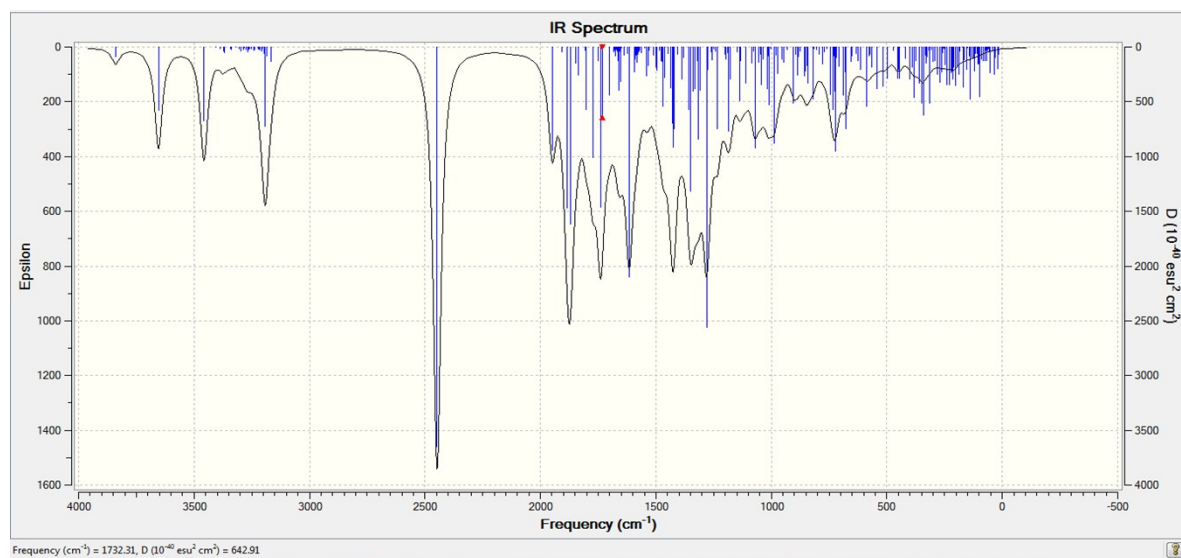


Fig. S2: TGA curve of pure algae



a



b

Fig.S3 (a) Experimental FT-IR spectra of the algae and fluoride loaded algae (lower curve). (b) DFT computed FT-IR spectra of the optimized structure of Phycocyanobilin2 loaded with fluoride.

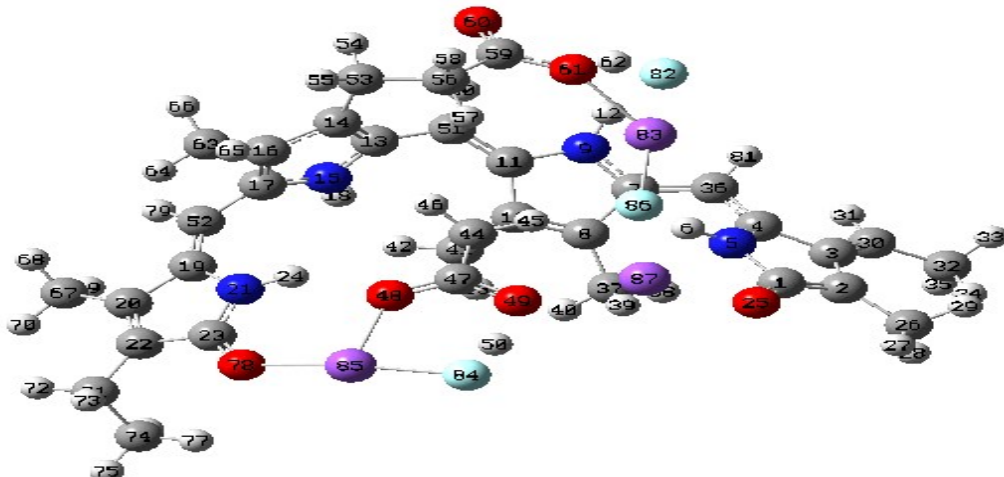
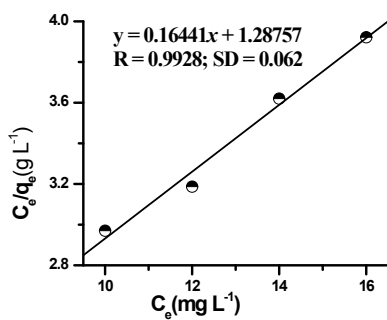
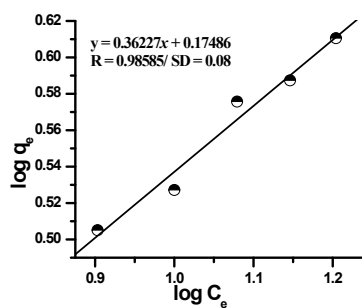


Fig. S4: optimized structure of Phycocyanobilin2 loaded with fluoride (Energy: -73680.85 eV; Dipole moment: 12.6 Debye; Hydrogen bond length in NH----F(86): 1.52 Å; C-OH---F(84): 1.03 Å and C-OH---F(82)---HN: 1.22 & 1.71 Å).



(a)



(b)

Fig. S5: (a) Langmuir isotherm (Plot of C_e vs C_e/q_e) and (b) Freundlich isotherm ($\log C_e$ vs $\log q_e$)

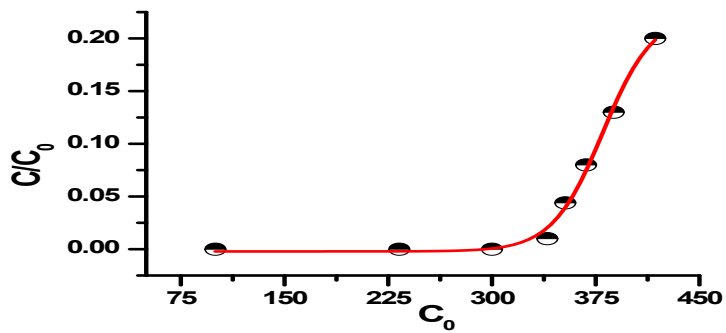


Fig. S6 Break-through curve

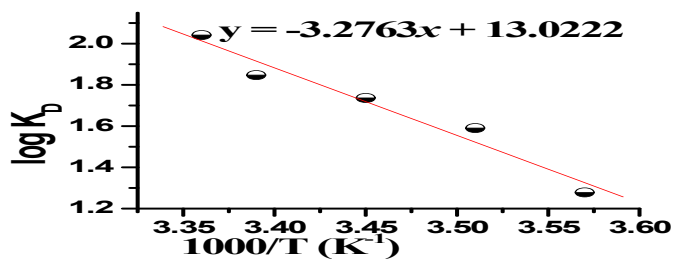


Fig. S7: Plot of $1000/T$ vs $\log K_d$

Table S1: FT-IR Peak positions and Peak assignment

Peak position	Nature of peak	Peak assignment	Ref.
3132-3650 cm ⁻¹	Sharp and broad peak extend up to 3000 cm ⁻¹	ν (N-H) in heterocyclic pyridyl ring and (C-O) in carboxylic acid; Formation of hydrogen bonds (Fig.9b) by electronegative fluoride. [NH stretching in NH---F(85) (DFT) at 3191.3 cm ⁻¹ and NH stretching in N(9)H---F(82) (DFT) at 3456.9 cm ⁻¹].	[15, 22]
2440 cm ⁻¹	Sharp and broad peak	ν (H-O) stretching in carboxylic acid. This new peak appears at 2440 cm ⁻¹ (adjacent to C-O in -COOH in pure algae appears 2338 cm ⁻¹) in the loaded exchanger only. [Peak at 2447.3 cm ⁻¹ (DFT) was found to be present for ν (OH) stretching mode in F(84)---HOOC confirming the F ⁻ intake].	[15, 22]
1616 cm ⁻¹ ; 1725 cm ⁻¹	Sharp and broad. A new peak appears at 1725 cm ⁻¹	ν (N-H) in heterocyclic pyridyl ring and ν (C-O) in carboxylic acid; Formation of hydrogen bonds (Fig.9b) by electronegative fluoride. A new peak appears at 1725 cm ⁻¹ in the loaded exchanger. [Peak at 1732.3 cm ⁻¹ (DFT) was found to be present for ν (NH) bending and Peak at 1807.8 cm ⁻¹ (DFT) for ν (OH) bending mode in NH---F(82)---HOOC].	[15, 22]

Table S2: Tolerance limits of foreign ions on the quantitative sorption (>93%) of fluoride;
Experimental conditions: Biomass: 1.0 g; volume of solution: 100 mL; Concentration:
0.02 mg mL⁻¹; pH: Neutral pH.

Concentrations of foreign ions: 50-100 mM L⁻¹

I ⁻	Cl ⁻	Br ⁻	SO ₄ ²⁻	PO ₄ ³⁻	CH ₃ COO ⁻	ClO ₄ ⁻
30	20	20	50	75	40	40
60	40	40	60	85	70	60
90	80	80	100	95	100	80
