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Supplementary Information

Selective recovery of lithium from spent coin cell cathode leachates using ion imprinted blended chitosan microfibers: Pilot scale studies provide insights on scalability

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1.0 Materials and Methods

1.0.1. Chemicals

Chitosans used in the present study were of shrimp origin and procured from Aldrich India. Chitosans procured were of following specifications: low viscosity chitosan (20-300 cps), moderate viscosity chitosan (200-800 cps) and high viscosity chitosan (800-1000 cps). Gluteraldehyde used for crosslinking was grade II (25% in H_2O). Pure form of lithium was obtained from lithium chloride (LiCl, ACS reagent, <0.002 % heavy metals). pH adjustements, biosorbent regeneration and chitosan solubilisation was done using HCl (0.1 M ,endotoxin free). Caustic alkali pellets were procured from SRL chemicals, Chennai.

1.0.2. Swelling Ratio

The swelling ratios were calculated for all blends of ChA-ChB(Cr) and ChA-ChC(Cr) microfibers were calculated by immersing the 2 g of dried microfibers in de-ionized water for 4 h and compared based on the following equation:

$$Swelling\ Ratio = \frac{W_t - W_0}{W_0} x100\% \quad [1]$$

1.0.3. Degree of Crosslinking

The degree of crosslinking was calculated in terms of the free amine content using a ninhydrin assay (Pozzo et 2019). 2 g of crosslinked chitosan microfibers were added to 1.5 mg/25 mL of ninhydrin solution, followed by stirring at 85°C for 3 h. The resulting suspension was centrifuged at 5000 rpm for 20 minutes. The supernatant was assessed using a spectrophotometer at 570 nm (model: Nova 1800 UV). The percentage of free amine (FA) was calculated as the ratio of absorbance of crosslinked to un-crosslinked microfibers. The technique was repeated for all the experimental runs and recorded in Tables S3 and S6.

1.0.4.Preliminary lithium uptake studies

The sorption experiments were conducted in a total working volume of 250 mL. Dried microfiber biomass dosage of 1 g/L were added to a solution containing 100±3.25 mg/L of Li^+ solution (prepared by dissolving 0.61 g of $LiCl_3$ in de-ionized water). The pH was adjusted to 6.1. Post addition of biomass, adsorption was allowed for a contact time of 30 minutes in an incubator shaker. A temperature of 40°C was maintained. A constant shaking speed was maintained. Parallel controls included samples without biomass and samples without lithium. The suspension was centrifuged at 5000 rpm for 15 minutes and the

supernatant was analysed for the residual lithium. The effect of pH on Li(I) was performed at a range between 2.0-8.0 following the methodology of Huang and Wang 2018.The residual Li(I) concentration in the solution was monitored using a pre-calibrated flame photometer (Flame Photometer 130, Compressor unit 126; 230V, 50Hz, LPG supported). Lithium uptake (q_e) values were calculated as per the equation:

$$q_e = \frac{C_0 - C_e}{m} xV \qquad [2]$$

where C_o and C_e are the initial and final concentrations of lithium (mg/L); V is total volume (L) of solution, m is the biosorbent mass (g).

1.1.List of Tables

Table S1: Characterization of chitosan samples

Chitosan Code	DA(%) [1]	Viscosity (mPa.s)[2]		
		1 mg/mL	2 mg/mL	3 mg/mL
ChA	19.27±1.79	1.65	2.70	4.15
ChB	23.11±2.26	1.68	4.06	6.40
ChC	25.27±0.94	2.64	4.81	10.75

[1] Degree of acetylation

2 Apparent viscosity determined in 0.1 M HCl at 25.1 °C ;Volume of Sample loaded: 2 mL

Table S2: Range of input parameters for assessing swelling ratio (SR) (%), degree of crosslinking (DC) (%) and lithium uptake (LU) (mg/g) onto ChA-ChB(Cr) and ChA-ChC(Cr) microfibers

Component	Unit	Low	Medium	High
$ChA_{(Low\ Viscosity)}$	mg/mL	1.00	2.00	3.00
$ChB_{(Medium\ Viscosity)}$	mg/mL	1.00	2.00	3.00
$ChC_{(High\ Viscosity)}$	mg/mL	1.00	2.00	3.00
Gluteraldehyde	%(v/v)	0.10	0.55	1.00

Table S3: Response values correlating lithium uptake (LU) (mg/g) with swelling ratio (SR) (%) and degree of crosslinking (DC) (%) on ChA-ChB(Cr) microfibers

Input Parameters				Response Parameters		
Run	A	B	C	R_1	R_2	R_3
1.	0	0	0	125.31±3.91	34.33± 0.06	6.77± 0.74
2.	-1	0	1	56.94±0.07	17.91± 0.71	9.19± 1.01
3.	1	0	-1	99.76± 2.11	13.22± 1.35	7.81± 0.97
4.	1	0	1	279.80±2.06	40.10± 3.71	4.99± 1.10
5.	0	-1	-1	1139.51±13.91	10.33± 0.54	1.10± 0.07
6.	-1	-1	0	320.83 ± 1.99	18.97± 2.50	4.33± 2.11
7.	0	0	0	125.40±1.03	34.30± 0.54	6.72± 1.13
8.	0	-1	1	1080.81± 2.17	16.90± 1.57	1.41± 0.91
9.	0	0	0	125.47± 1.05	34.32± 5.61	6.77± 0.07
10.	1	1	0	123.42± 0.71	26.95± 6.09	9.02± 0.65
11.	-1	1	0	231.70± 0.94	13.71± 2.55	6.70± 0.08
12.	0	1	1	1070.21± 10.01	26.72± 7.01	1.82± 0.01
13.	0	1	-1	235.81± 2.17	10.11± 0.03	6.11± 1.33
14.	0	0	0	125.49± 1.15	34.35± 9.35	6.79± 2.01
15.	-1	0	-1	325.80± 0.71	11.25± 1.00	4.17± 1.92
16.	1	-1	0	389.91± 4.25	39.01± 1.07	3.42± 0.92
17.	0	0	0	125.42± 4.01	34.39± 0.06	6.71± 1.33

*Input Parameters A: ChA dosage (mg/mL); B: ChB dosage (mg/mL); C: Gluteraldehyde dosage (% v/v); Response Parameters: R_1: Swelling Ratio (%) (SR); R_2: Degree of crosslinking (%) (DC); R_3: Lithium uptake (mg/g) (LU)

Table S4 : Predicted values correlating LU with SR and DC on ChA-ChB(Cr) microfibers

	Input Parameters			Predicted Parameters		
Run	A	B	C	R_1^P	R_2^P	R_3^P
1.	0	0	0	4.84	34.3	6.72
2.	-1	0	1	4.31	18	8.40
3.	1	0	-1	4.35	18.2	8.43
4.	1	0	1	5.72	42.31	4.44
5.	0	-1	-1	7.47	8.92	-0.30
6.	-1	-1	0	5.95	19.91	4.27
7.	0	0	0	4.80	34.30	6.70
8.	0	-1	1	6.63	23.11	2.17
9.	0	0	0	4.80	34.30	6.70
10.	1	1	0	5.16	23.22	7.54
11.	-1	1	0	5.17	19.99	7.52
12.	0	1	1	6.63	23.15	3.12
13.	0	1	-1	5.84	8.92	5.44
14.	0	0	0	4.80	34.30	6.70
15.	-1	0	-1	5.73	13.96	4.52
16.	1	-1	0	5.91	34.42	4.21
17.	0	0	0	4.80	34.30	6.70

*Input Parameters: A: ChA dosage (mg/mL); B: ChB dosage (mg/mL); C: Gluteraldehyde dosage (% v/v); R_1^P: Predicted values on Swelling Ratio (%) (SR); R_2^P: Predicted values on Degree of crosslinking (%) (DC); R_3^P: Predicted values on Lithium uptake (mg/g) (LU)

*Quadratic Equations:

$$*SR = 125.35-5.28A-158.73B+85.90C-44.39AB+112.23AC+223.26BC-274.92A^2+416.01B^2+340.17C^2$$

$$*DC = 34.30+7.18A-0.97B+7.10C-1.71AB+5.05AC+2.50BC-2.53A^2-7.13B^2-11.17C^2$$

*LU = 1.11+0.18A-0.89B-0.04C+0.05AB+0.44AC+1.56BC-2.12A^2+3.22B^2+2.32C^2

Table S5: p-values for single, interaction and quadratic factors for ChA-ChB(Cr) microfibers

Source	SR	DC	LU
Model	0.0011	0.0017	0.002
A-ChA	0.9766	0.0015	0.682
B-ChB	0.0104	0.519	0.0015
C-Gluteraldehyde	0.4244	0.0016	0.5037
AB	0.2269	0.4266	0.1227
AC	0.003	0.0412	0.0044
BC	0.0403	0.2565	0.0452
A^2	0.0182	0.2406	0.0143
B^2	0.0001	0.0086	0.0013
C^2	0.0036	0.0008	0.0064
R^2	0.9466	0.9399	0.9364
Adequate Precision	12.84	11.12	12.13

Table S6: Response values correlating lithium uptake (LU) (mg/g) with swelling ratio (SR) (%) and degree of crosslinking (DC) (%) on ChA-ChC(Cr) microfibers

	Input Parameters			Response Parameters		
Run	A	B	C	R_1	R_2	R_3
1.	0	1	-1	945.85± 11.27	9.35± 0.07	2.82±1.19
2.	0	0	0	101.29± 1.01	57.39± 0.71	8.95±1.15
3.	-1	1	0	895.83± 3.55	34.29± 2.01	3.15±0.01
4.	1	-1	0	472.11± 7.55	65.60±10.35	4.37±0.75
5.	0	1	1	267.94± 12.19	20.23± 0.35	6.96±3.2
6.	0	0	0	101.29± 10.11	57.35± 4.25	8.91±0.76

7.	-1	-1	0	46.85± 1.06	48.95± 0.66	10.44±0.71
8.	0	0	0	101.20± 0.22	57.31± 1.07	8.90±2.79
9.	0	-1	-1	98.92± 10.33	16.15± 2.29	9.35±1.99
10.	1	0	-1	201.51± 0.71	16.75±1.33	7.33±1.07
11.	0	-1	1	29.42± 2.22	66.73± 1.39	11.30±2.25
12.	-1	0	-1	909.89±1.35	9.35± 2.25	2.93±0.41
13.	0	0	0	101.24±0.06	57.34±1.19	8.94±0.11
14.	1	1	0	203.51± 2.29	40.34±2.33	7.34±2.35
15.	1	0	1	125.40± 0.01	52.35± 1.52	8.21±0.01
16.	0	0	0	101.2±19.71	57.31± 5.61	8.92±1.18
17.	-1	0	1	201.22±13.47	45.31± 9.99	7.44±1.79

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*Input Parameters A: ChA dosage (mg/mL); B: ChC dosage (mg/mL); C: Gluteraldehyde dosage (% v/v); Response Parameters: R_1: Swelling Ratio (%) (SR); R_2: Degree of crosslinking (%) (DC); R_3: Lithium uptake (mg/g) (LU)

*All experiments have been performed in triplicates and standard deviation values are mentioned. Conditions: pH: 6.1; Initial Lithium concentration: 30.06±1.19 mg/L; Contact time: 30 minutes; Biomass dosage: 1 g/L; Shaking speed: 110 rpm; Working volume: 250 mL; Temperature: 25.1°C.

Table S7: Predicted values correlating LU with SR and DC on ChA-ChC(Cr) microfibers

	Input Parameters			Predicted Parameters		
Run	A	B	C	R_1^P	R_2^P	R_3^P
1.	0	1	-1	792.71	9.70	3.97
2.	0	0	0	101.27	57.34	5.23
3.	-1	1	0	1023.54	30.91	11.20
4.	1	-1	0	344.33	63.62	7.22
5.	0	1	1	105.57	23.17	3.63
6.	0	0	0	101.27	57.34	3.01
7.	-1	-1	0	48.32	54.34	0.06
8.	0	0	0	101.27	57.34	0.75

9.	0	-1	-1	72.11	13.25	4.81
10.	1	0	-1	306.54	53.91	2.73
11.	0	-1	1	6.71	66.30	3.97
12.	-1	0	-1	745.93	9.62	4.58
13.	0	0	0	101.27	57.34	3.97
14.	1	1	0	201.93	40.21	3.97
15.	1	0	1	100.17	52.25	3.50
16.	0	0	0	101.27	57.34	3.97
17.	-1	0	1	46.66	42.91	7.63

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*Input Parameters: A: ChA dosage (mg/mL); B: ChC dosage (mg/mL); C: Gluteraldehyde dosage (% v/v); R_1^P: Predicted values on Swelling Ratio (%) (SR); R_2^P: Predicted values on Degree of crosslinking (%) (DC); R_3^P: Predicted values on Lithium uptake (mg/g) (LU)

*Quadratic Equations:

*SR= 101.22-131.39A+208.21B-191.51C-279.39AB+158.14AC-152.08 BC+163.61 A^2+139.68 B^2+94.59 C^2

*DC= 57.30+4.65A-11.66B+16.64C-2.65AB-0.10AC-9.92BC-3.61A^2-6.44B^2-22.79C^2

*LU = 3.97-0.93A+2.06B-1.52C-3.17AB+0.48AC+0.20BC+0.97A^2+0.11B^2-0.24C^2

Table S8: p-values for single, interaction and quadratic factors for ChA-ChC(Cr) microfibers

Source	SR	DC	LU
Model	0.0005	0.0001	<0.0001
A-ChA	0.0064	0.0012	<0.0001
B-ChB	0.0005	<0.0001	<0.0001
C-Gluteraldehyde	0.0008	<0.0001	<0.0001
AB	0.0007	0.0715	<0.0001
AC	0.0137	0.9384	<0.0001
BC	0.0163	<0.0001	<0.0001
A^2	0.0104	0.0209	<0.0001
B^2	0.021	0.0011	<0.0001

C^2	0.0848	<0.0001	0.0076
R^2	0.9592	0.9933	0.9995
Adequate Precision	13.14	29.64	142.12

Table S9: Properties of crosslinked and Li(I) imprinted chitosan microfibers

Sample Code	pHpzc	Ion Exchange Capacity (meq/g)	Microfiber Diameter (µm)
ChA-ChB(Cr)	5.2±0.3	2.79±0.01	496.7±3.59
ChA-ChB(Cr-Li)	4.9±0.7	3.76±0.25	225.9±1.57
ChA-ChC(Cr)	5.4±0.1	6.52±0.33	176.5±3.44
ChA-ChC(Cr-Li)	5.1±0.1	8.45±0.07	86.9±1.01

Table S10: Batch scale uptake values of various elements on ChA-ChB(Cr) microfibers

Elements	Uptake Values (mg/g)				
	n=1	n=5	n=20	n=50	n=100
Lithium	2.01±0.63	9.91±1.37	20.83±1.61	70.21±4.04	15.25±6.17
Cobalt	0.04±0.01	3.90±0.46	3.01±0.69	5.10±1.71	27.8±5.91
Manganese	0.25±0.07	3.68±1.94	7.43±1.19	17.11±7.16	15.13±2.30
Silver	0.75±0.11	4.97±1.71	2.98±1.56	13.45±2.90	7.18±3.36
Aluminium	0.15±0.70	0.82±0.27	0.68±0.13	0.85±0.29	1.73±0.91
Nickel	0.00±0.00	0.00±0.00	0.06±0.01	0.12±0.02	0.10±0.07
Copper	0.00±0.01	0.00±0.00	0.02±0.00	0.34±0.09	0.75±0.08
Sodium	0.23±0.09	1.81±0.60	4.83±1.79	7.03±2.17	25.18±8.71
Potassium	0.61±0.23	0.86±0.17	8.98±1.37	7.81±1.20	24.82±6.70
Calcium	0.96±0.11	2.71±1.35	5.02±2.16	6.38±1.71	14.08±3.47

Table S11: Batch scale uptake values of various elements on ChA-ChC(Cr) microfibers

Elements	Uptake Values (mg/g)				
	n=1	n=5	n=20	n=50	n=100
Lithium	3.13±1.04	1.70±0.36	28.62±1.17	92.49±2.56	39.00±3.12
Cobalt	0.08±0.03	1.56±0.79	7.03±0.51	4.07±0.29	5.98±1.03
Manganese	0.21±0.03	2.21±0.37	5.45±1.73	7.08±0.47	8.47±0.73
Silver	0.59±0.06	4.11±0.63	3.07±0.31	7.43±1.21	5.14±0.81
Aluminium	0.00±0.00	0.00±0.00	0.04±0.00	0.48±0.13	1.67±0.37
Nickel	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.01	0.20±0.04
Copper	0.00±0.00	0.05±0.02	0.00±0.00	0.14±0.03	0.41±0.02
Sodium	0.06±0.01	0.74±0.15	3.97±1.53	7.85±1.01	14.21±2.00
Potassium	0.95±0.10	0.99±0.07	14.96±1.15	13.63±2.51	8.98±0.70
Calcium	0.46±0.11	2.98±0.25	4.12±1.03	4.36±0.19	4.79±0.05

Table S12: Batch scale uptake values of various elements on ChA-ChB(Cr-Li) microfibers

Elements	Uptake Values (mg/g)				
	n=1	n=5	n=20	n=50	n=100
Lithium	3.40±0.39	13.59±1.26	37.65±1.52	73.82±4.10	65.16±1.97
Cobalt	1.00±0.14	0.92±0.25	2.13±0.67	5.22±0.40	1.82±0.47
Manganese	0.40±0.01	1.02±0.05	4.71±0.30	4.08±1.20	16.63±1.59
Silver	0.55±0.37	5.29±0.43	3.21±0.73	6.45±1.34	4.00±0.63
Aluminium	0.00±0.00	0.10±0.00	0.35±0.17	0.80±0.21	0.70±0.24
Nickel	0.04±0.01	0.07±0.04	0.08±0.02	0.02±0.00	0.05±0.00
Copper	0.00±0.00	0.01±0.00	0.00±0.00	0.18±0.07	0.27±0.09
Sodium	0.83±0.07	0.28±0.09	11.99±2.71	5.86±0.37	10.02±1.50
Potassium	1.17±0.24	2.93±0.21	6.82±1.02	5.79±0.43	5.98±0.83

Calcium	0.36±0.14	3.70±0.43	1.12±0.57	3.22±0.40	5.94±0.06

Table S13: Batch scale uptake values of various elements on ChA-ChC(Cr-Li) microfibers

Elements	Uptake Values (mg/L)				
	n=1	n=5	n=20	n=50	n=100
Lithium	4.86±0.31	18.91±1.49	52.50±8.72	131.49±11.01	90.25±17.11
Cobalt	0.00±0.00	0.05±0.01	0.16±0.04	2.90±0.31	7.80±1.03
Manganese	0.09±0.01	0.96±0.21	0.79±0.23	1.13±0.24	6.43±1.50
Silver	0.30±0.17	1.45±0.29	2.02±0.71	3.33±0.47	1.58±0.31
Aluminium	0.00±0.00	0.00±0.00	0.03±0.01	0.05±0.02	0.05±0.00
Nickel	0.00±0.00	0.00±0.00	0.01±0.00	0.02±0.00	0.02±0.01
Copper	0.00±0.00	0.01±0.00	0.00±0.00	0.05±0.01	0.19±0.06
Sodium	0.40±0.07	1.78±0.32	5.15±1.00	8.00±1.37	4.06±0.77
Potassium	0.85±0.32	4.94±0.71	7.06±1.32	4.65±0.97	5.10±0.61
Calcium	0.08±0.03	2.96±0.41	1.02±0.17	1.36±0.21	0.49±0.05

*For Tables S11-S14: *Source: Leachate concentrate of 100 mL obtained using 2 M HCl from powdered cathodes of LCCs madxe up to 1000 mL. Conditions: Biomass dosage: 1 g/L, Shaking speed: 110 rpm, Working volume: 250 mL, Temperature: 25ºC in a shaking incubator. Contact time: 60 minutes

Table S14: Kinetic parameters for evaluation of rate of lithium sorption

n	Parameter	ChA-ChB(Cr)	ChA-ChC(Cr)	ChA-ChB(Cr-Li)	ChA-ChC(Cr-Li)
Pseudo-first Order					
1	K_{1p} (min^{-1})	0.01835	0.01201	0.00065	0.00149
	q_e (mg/g)	2.791	4.717	40.87	26.47
	R^2	0.9848	0.9202	0.9787	0.9160
5	K_{1p} (min^{-1})	0.01845	0.03051	0.00797	0.00478
	q_e (mg/g)	11.53	12.27	23.79	75.02
	R^2	0.9612	0.9831	0.9652	0.9334
20	K_{1p} (min^{-1})	0.03087	0.02333	0.01817	0.01278

	q_e (mg/g)	22.21	25.83	42.54	155.3
	R^2	0.9816	0.9594	0.9846	0.9711
50	K_{1p} (min^{-1})	0.03048	0.02806	0.01094	0.00763
	q_e (mg/g)	41.03	102.6	117.6	426.6
	R^2	0.9921	0.9776	0.9568	0.9509
Intra-particle Diffusion					
1	K_{ip}	0.231	0.315	0.237	0.335
	R^2	0.9613	0.8583	0.8498	0.7830
5	K_{ip}	0.956	1.205	1.229	2.634
	R^2	0.9209	0.9271	0.8937	0.8292
20	K_{ip}	6.446	6.854	10.220	31.150
	R^2	0.9244	0.8604	0.8602	0.7889
50	K_{ip}	11.870	28.960	21.440	61.490
	R^2	0.9387	0.9020	0.7434	0.7226

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*Kinetic studies were performed under a batch scale under varying lithium dosages. The experiments were conducted at time intervals of 20 minutes at the range of 0-120 minutes, stirring speed of 110 rpm, temperature maintained at 25°C and biomass dosage of 1 g/L

1.2.List of Figures

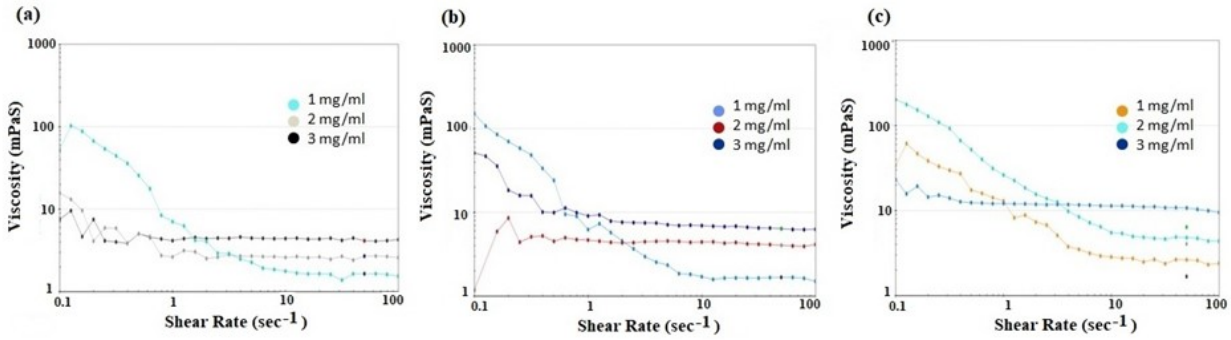

Figure S1: Viscosities flow curves for (a) ChA (b) ChB and (c) ChC at varying concentrations

*All blends or individual chitosans analysed for viscosities have been dissolved in 0.1 M HCl and the viscosities obtained at temperature of 25.1°C. The concentration range has been chosen similar to the ones used to prepare chitosan microfibers (Table S2). The values of viscosity provides an insight on the significance of rheological characteristics of a polymer which could be of high relevance in the recovery of value added metals.

*ChA: Low Viscosity Chitosan ; ChB: Moderate Viscosity Chitosan; ChC: High Viscosity Chitosan

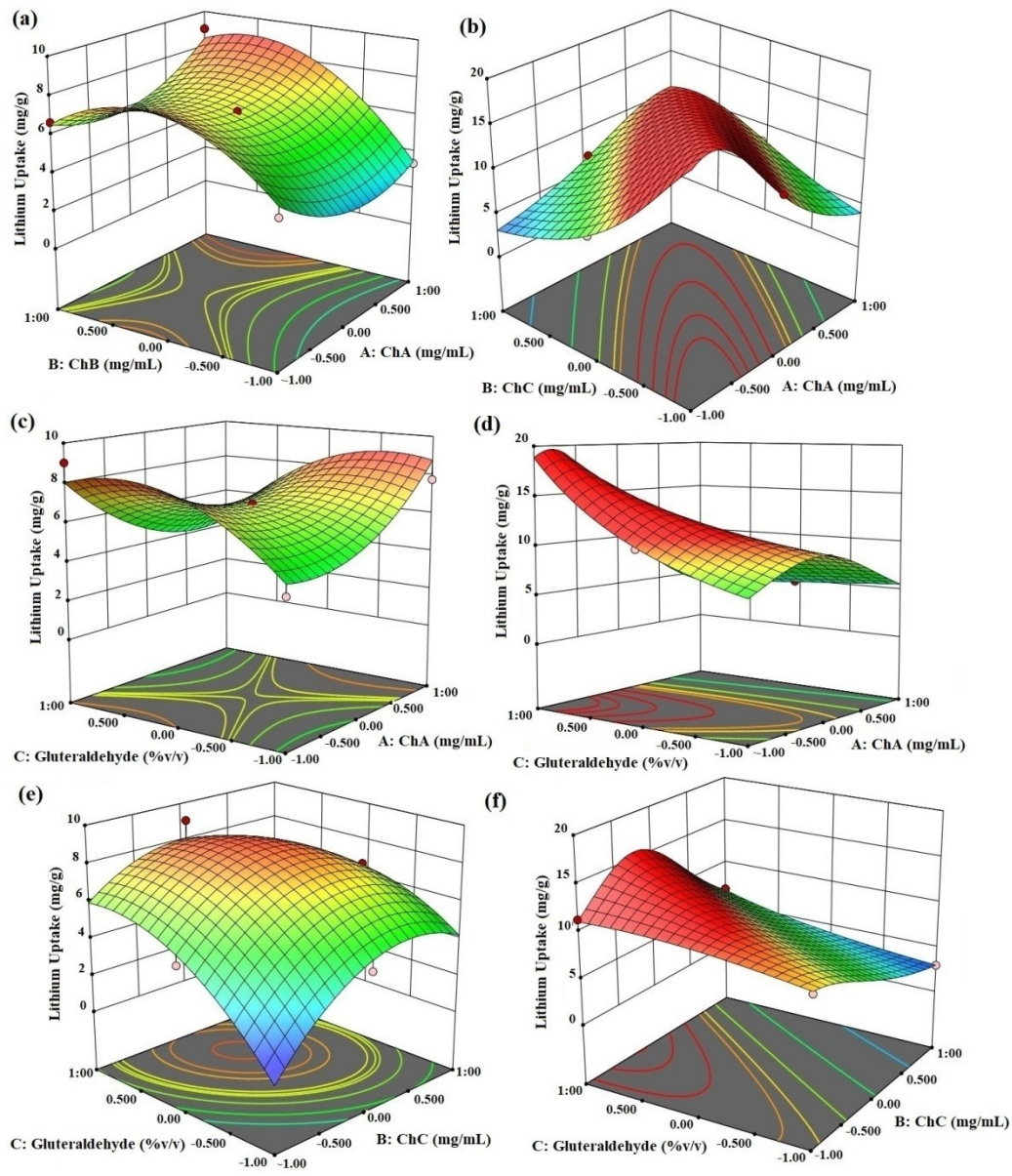

Figure S2: Effect of interactions on lithium uptake (mg/g) onto ChA-ChB(Cr) (a,c,e) and ChA-ChC(Cr) (b,d,f) microfibers. Red zones indicate high uptake regions. Moderate or low uptake values were indicated by green and blue zones. The images represents the interaction between chitosan variants and gluteraldehyde. Maximum lithium uptake values were noted at blends containing low dose ChA-moderate dose ChB and moderate dose ChA-low dose ChC blends.

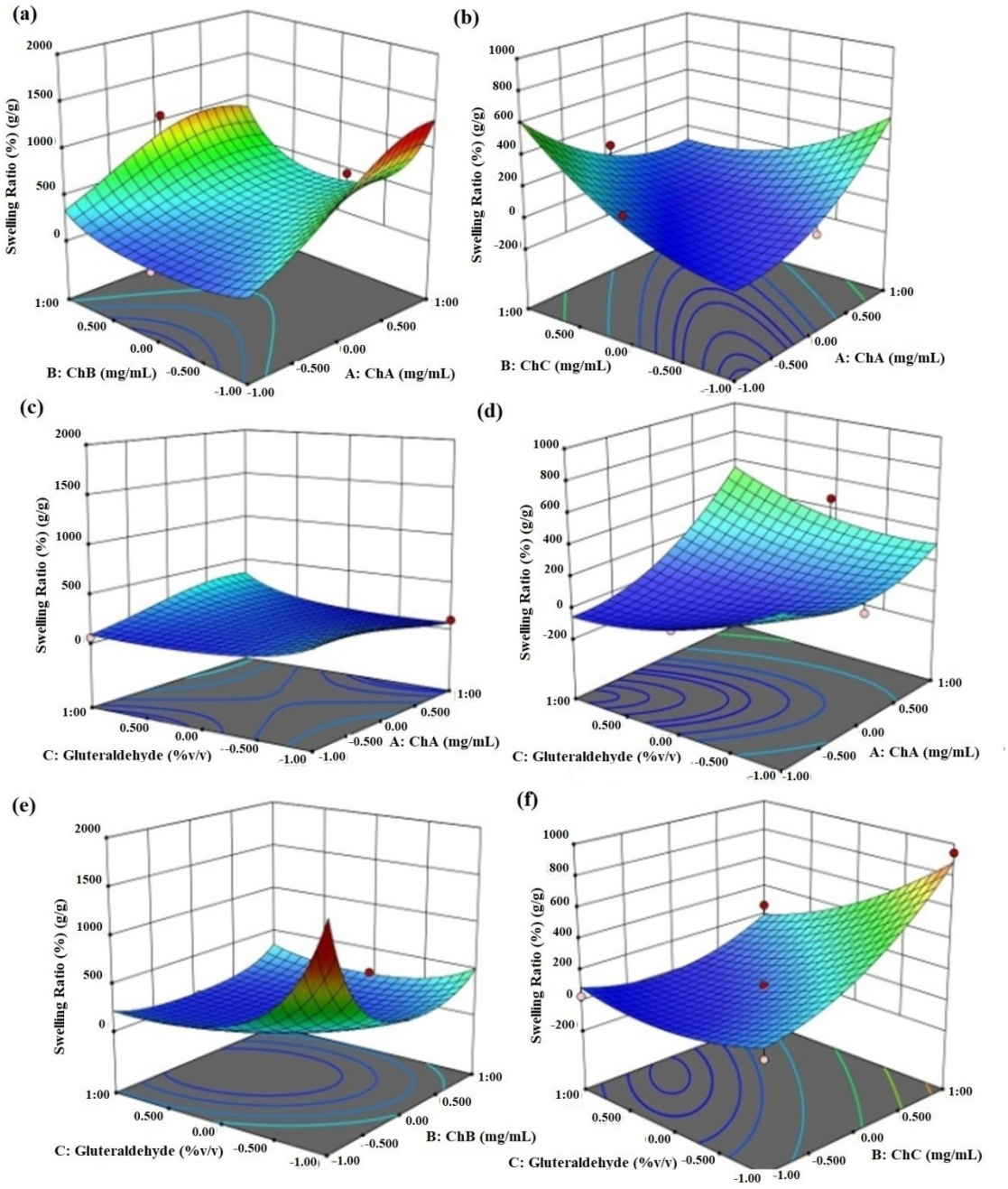

Figure S3: Effect of interactions on swelling ratio of ChA-ChB(Cr) (a,c,e) and ChA-ChC(Cr) (b,d,f) microfibers. Interactions include the following: (a) ChA and ChB (b) ChA and ChC (c) ChA and gluteraldehyde in a ChA-ChB blend (d) ChA and gluteraldehyde in a ChA-ChC blend (e) ChB and gluteraldehydein a ChA-ChB blend (f) ChC and gluteraldehyde in a ChA-ChC blend

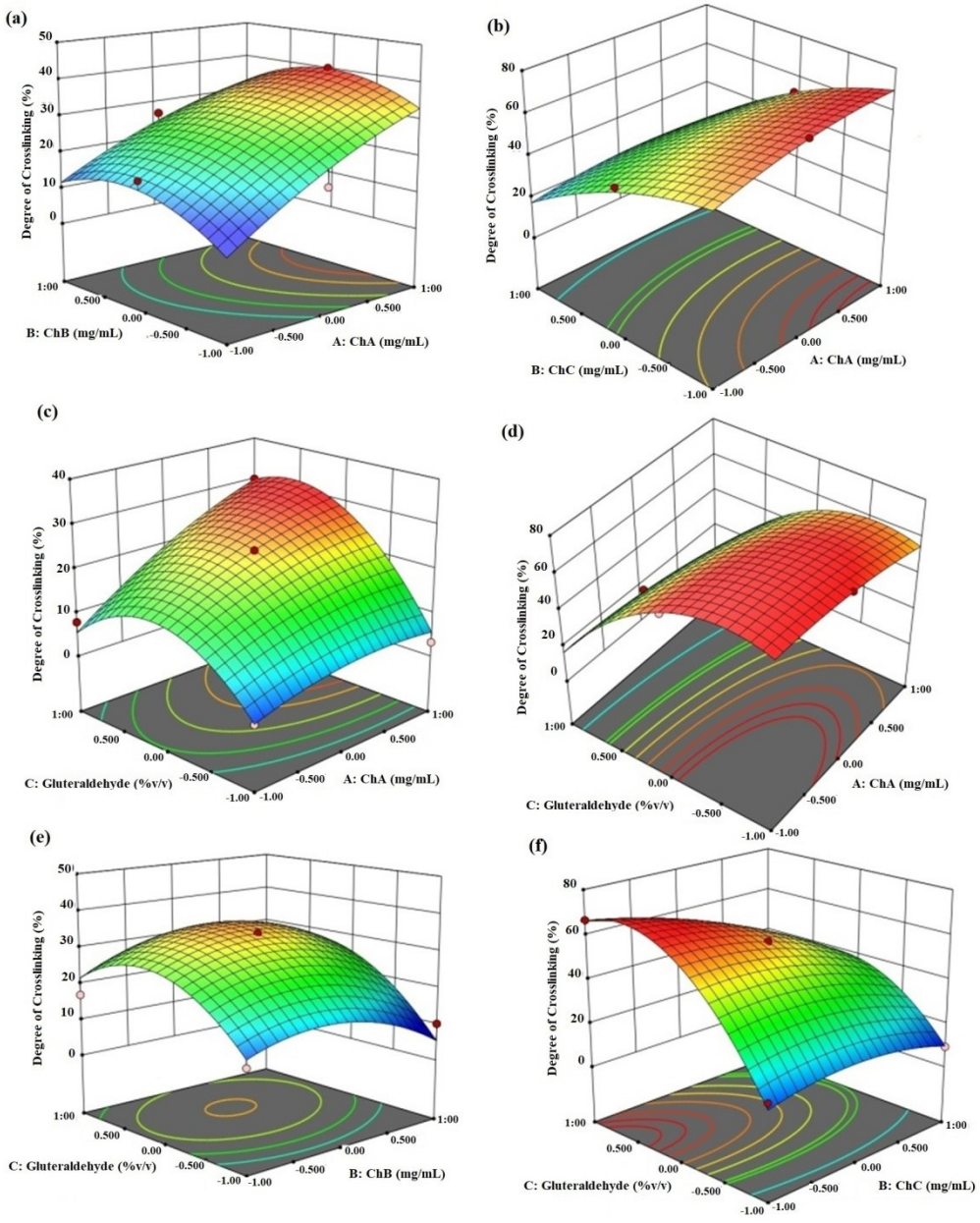

Figure S4:Effect of interactions on degree of crosslinking of ChA-ChB (a,c, e) and ChA-ChC (b,d,f) microfibers. Interactions include the following: (a) ChA and ChB (b) ChA and ChC (c) ChA and gluteraldehyde in a ChA-ChB blend (d) ChA and gluteraldehyde in a ChA-ChC blend (e) ChB and gluteraldehydein a ChA-ChB blend (f) ChC and gluteraldehyde in a ChA-ChC blend

*For Figures S2-S4: Lithium uptake studies have been conducted under the following conditions: Contact time: 60 minutes; Shaking speed: 110 rpm; pH: 6.1; Biomass dosage: 1.0 g/L; Initial lithium concentration: 30.06±1.19 mg/L, temperature: 40°C. Experiments were conducted in triplicates.

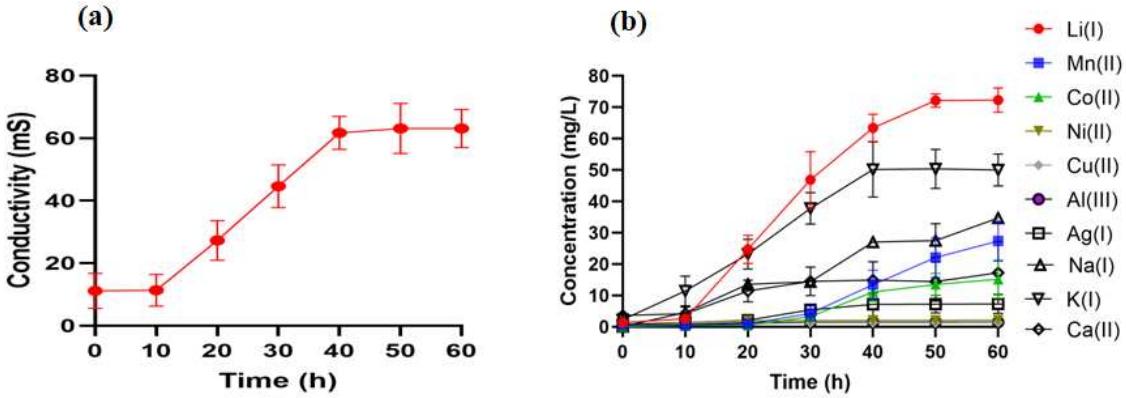

Figure S5: (a) Conductivity values of leachate (b) Co-ions in 100 mL of leachate

*Total leachate volume: 100 mL; Leaching agent: 2M HCl; Time: 60 minutes; Shaking speed: 110 rpm, Temperature: 25°C, LCC powder dosage: 50 g/L

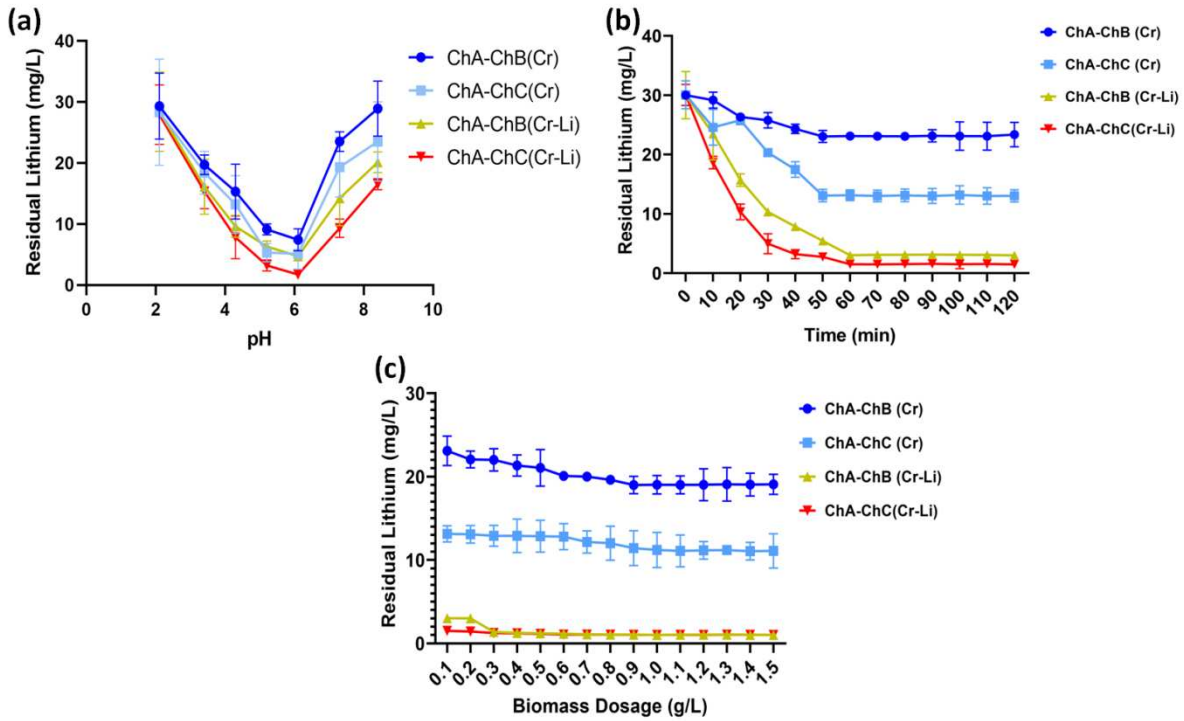

Figure S6: (a) Effect of pH (b) Effect of contact time (c) Effect of biomass dosage on lithium sorption

* Shaking Speed: 110 rpm; Temperature: 40°C; number of cathodes used: 5; Total weight of cathode: 4.96±0.75 g; Initial lithium concentration: 30.06±1.25 mg/L; Compositions: ChA-ChB: ChA: 1 mg/mL, ChB: 2 mg/mL; Gluteraldehyde: 1% (v/v), ChA-ChC: ChA: 2 mg/mL, ChC: 1 mg/mL, Gluteraldehyde: 1% (v/v); Characteristics: ChA-ChB: SR:56.94±0.07, DC: 17.91%±0.71, LU: 9.19±1.01, ChA-ChC: SR:29.42±2.22, DC: 66.73%±1.39, LU: 11.30±2.25

*Studies on the effect of pH and contact time has been conducted with a biomass dosage of 1 g/L; Studies on the effect of contact time and biomass dosage have been conducted at pH value of 6.1

*ChA-ChB(Cr): Crosslinked microfibers with blends of ChA and ChB; ChA-ChC(Cr): Crosslinked microfibers with blends of ChA and ChC; ChA-ChB(Cr-Li): Crosslinked microfibers with blends of ChA and ChB imprinted with lithium; ChA-ChC(Cr-Li): Crosslinked microfibers with blends of ChA and ChC imprinted with lithium

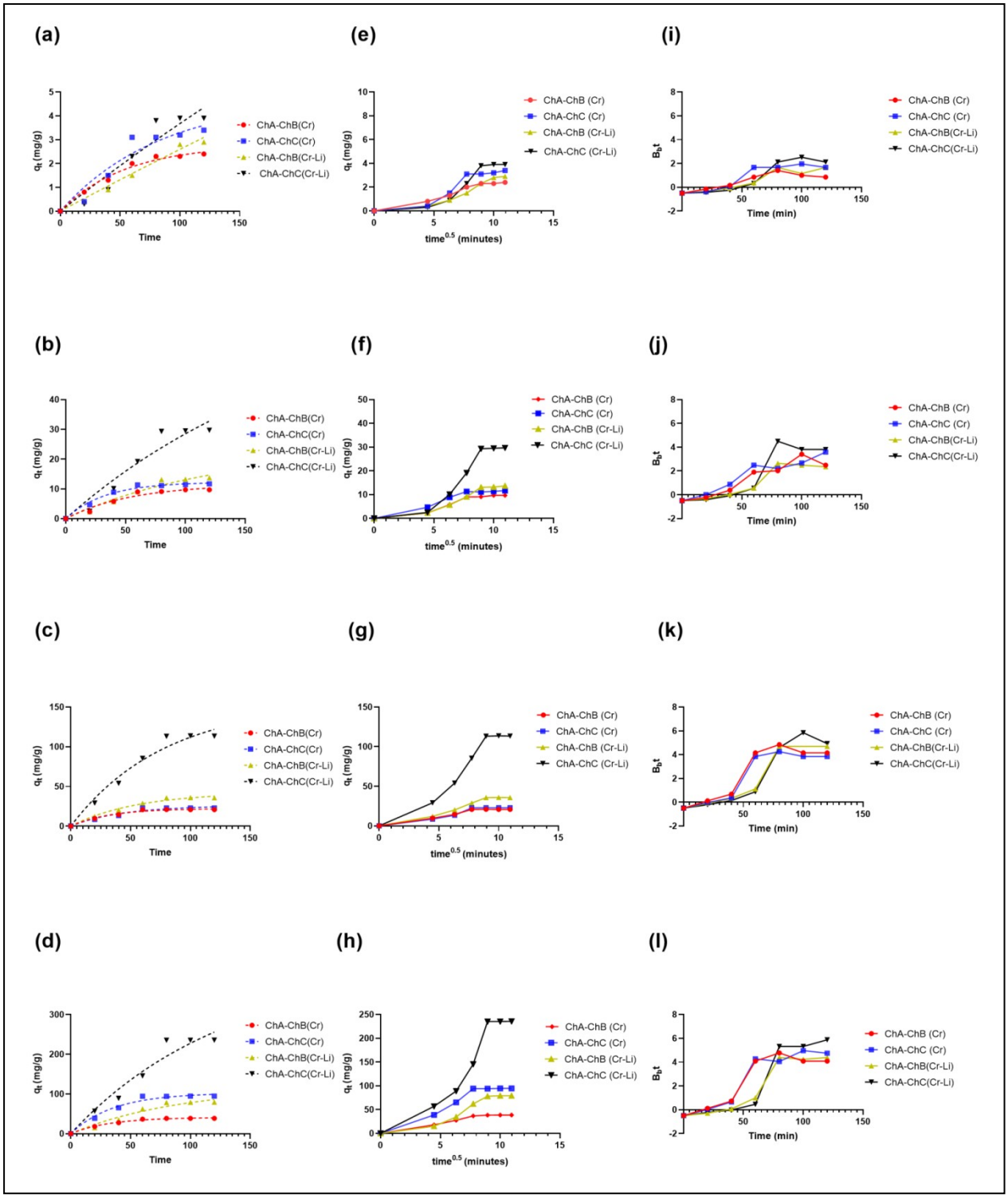

Figure S7: Kinetic models* for Li(I) sorption onto imprinted and non-imprinted chitosan microfibers (a)-(d) Pseudo-first order (e)-(h) Intra-particle diffusion (i)-(l) Boyd Plot

*Experiments were performed for a duration of 120 minutes at 20 minute interval. pH maintained at 6.1, total working volume of 250 mL, shaking speed: 110 rpm