Supporting information file

Exploring the ion exchange and separation capabilities of thermally stable acrylamide zirconium (IV) sulphosalicylate (AaZrSs) composite material

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Table S1 Reproducibility data of different batches of sample No.4 in terms of ion exchange capacity

Batch No.	Mixing ratio (v/v/v)	Temperature (°C)	IEC for Na^+ Ions
1	1:1:1	25± 0.5	2.70
2	1:1:1	25± 0.5	2.69
3	1:1:1	25± 0.5	2.71
4	1:1:1	25± 0.5	2.72
5	1:1:1	25± 0.5	2.72

Table S2 Elution behavior of 1 g column bed of acrylamide zirconium(IV) sulphosalicylate (AaZrSs)

volume of effluent in ml	Milli eq.of H^+ ions released
0	0.25
10	0.2
20	0.15
30	0.13
40	0.1
50	0.098
60	0.094
70	0.092
80	0.09
90	0.087
100	0.085

Table S3 Effect of temperature on the ion exchange capacity of acrylamide zirconium(IV) sulphosalicylate (AaZrSs) on heating time for 1hour

Temperature(°C)	IEC	% retention of IEC
100	2.54	94.2
200	2.21	81.9
300	1.89	70.2
400	1.62	60.3
500	0.95	35.5

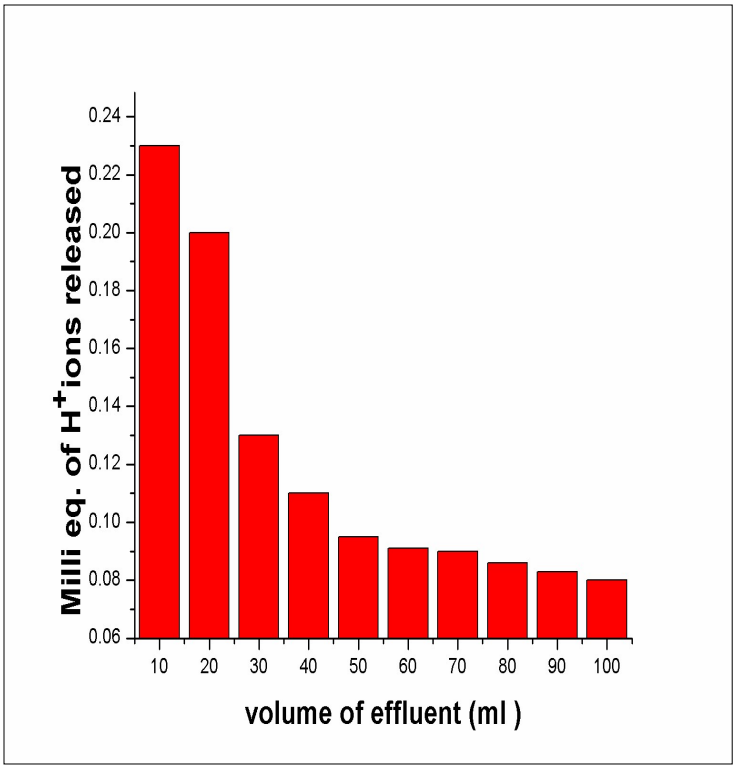

Fig. S1 Histogram showing elution behaviour of acrylamide zirconium(IV) sulphosalicylate (AaZrSs) with 1M sodium Nitrate

Table S4 Effect of pH on the removal of Cd(II) by hybrid material (AaZrSs). Experimental conditions: dose = 300 mg, contact time = 180 min, stirring speed = 130 rpm

pH	Amount adsorbed (q_e mg/g)	Removal of Cd(II) (%)
1	5.11	37.38
2	5.82	43.08
3	8.48	65.38
4	10.84	83.23
5	12.29	94.81
6	12.32	98.77
6.5	12.35	98.87
7	12.35	98.87
8	12.35	98.87
9	11.82	96.34
10	10.55	94.42
11	9.54	92.47

Table S5 Effect of adsorbent dose (AaZrSs) on % removal of Cd (II). Experimental conditions: Cd(II) = 100ppm, contact time = 180 min, stirring speed = 130 rpm, pH = 6.5

Adsorbent dose (g)	Amount adsorbed (q_e mg/g)	Removal of Cd(II) (%)
0.1	9.90	37.67
0.15	10.07	47.75
0.2	10.75	61.27
0.25	11.45	76.37
0.3	12.93	91.56
0.35	12.98	96.88

Table S 6 Effect of initial concentration of Cd (II) on % removal. Experimental conditions: dose = 300 mg, contact time = 180 min, stirring speed= 130 rpm, pH= 6.5

Initial Conc. Cd(II) (ppm)	Amount adsorbed (q_e mg/g)	Removal of Cd(II) (%)
100	12.97	99.42
120	15.17	97.65
140	17.21	95.42
160	19.10	93.00
180	19.45	84.29
200	20.84	81.51
220	21.60	76.93
240	22.09	72.17
260	23.26	69.17
280	23.34	69.09

Table S7 Effect of contact time on % removal of Cd (II). Experimental conditions: Cd(II) = 100ppm, stirring speed = 130 rpm, pH = 6.5, dose = 300 mg

Time(min)	Amount adsorbed (q_t mg/g)	Removal of Cd(II) (%)
30	4.20	32.00
45	6.78	52.70
60	8.02	62.64
90	10.58	82.44
120	11.57	91.00
150	12.06	94.94
180	12.57	99.02
210	12.57	99.02

Table S8 Lagergren first order for Cd(II) adsorption on AaZrSs

Time(min)	$\log(q_e-q_t)$
30	0.8237
60	0.6637
90	0.568
120	0.1999
180	-0.0054

Table S9 Pseudo second order for Cd(II) adsorption on AaZrSs

Time (min)	t/q_t
30	7.6387
60	9.2474
90	11.1125
120	11.9993
180	15.9550

Table S 10 Effect of temperature on amount adsorbed of Cd(II) on AaZrSs

T (°C)	q_e (mg/g)
30	29.680
35	33.573
40	39.740
45	42.232
50	45.921

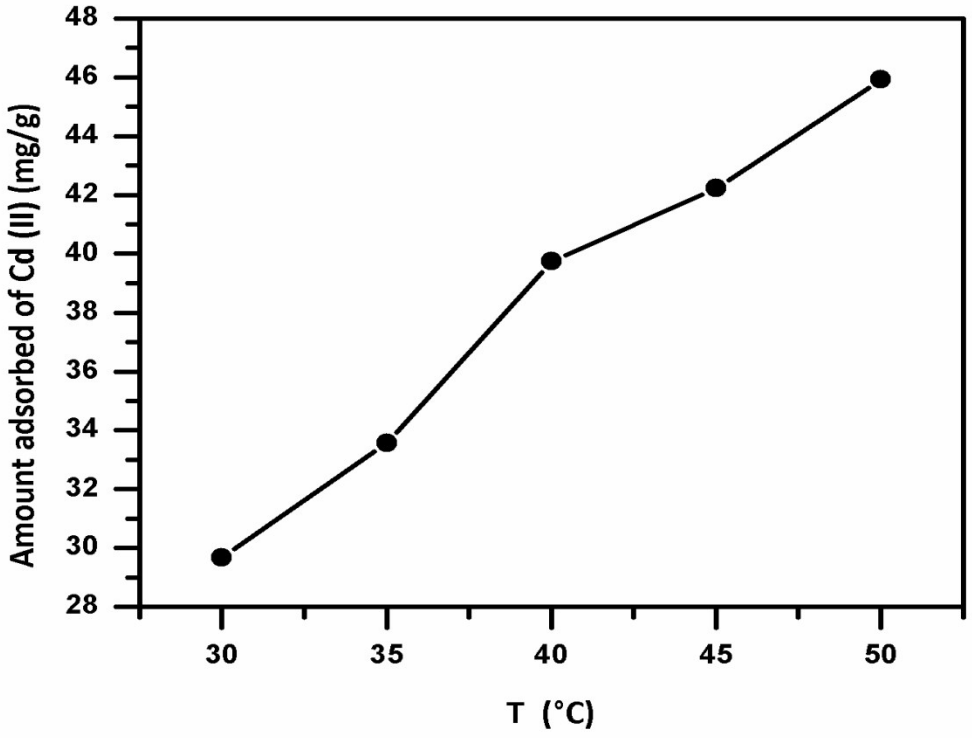

Fig. S2 Effect of temperature on the amount of Cd(II) adsorbed by the hybrid material: acrylamide zirconium(IV)sulphosalicylate (AaZrSs). Experimental conditions: adsorbent dose = 300mg, pH = 6.5, contact time = 180 min and stirring speed = 130 rpm

Table S11 Langmuir isotherm for adsorption of Cd(II) on AaZrSs

C_e	C_e/q_e
103.15	5.1307
111.3	5.2083
126.45	5.6775
142.4	6.1738
161.27	6.8344
180.54	7.5145
199.92	8.1968

Table S12 Freundlich isotherm for adsorption of Cd(II) on AaZrSs

$\log C_e$	$\log q_e$
2.0134	1.3923
2.0464	1.4158
2.1019	1.4257
2.1535	1.4356
2.2075	1.4377
2.2565	1.4423
2.3008	1.4425