Supplemental Data

Comparative study on Efficiency of Surface Enhanced Coal Fly Ash and Raw Coal Fly Ash for the Removal of Hazardous Dyes in Wastewater: Optimization through Response Surface Methodology

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Section S1: Zeta sizer and potential

This technique was used to investigate the stability of the particles by calculating their static charge and particle sizes in the colloidal solution. The more the static charge (either positive or negative), the less likely the particles aggregate and hence more stable is the colloidal solution. In this study, RCFA and SECFA exhibited the static charges of -27.3 mV and -28.2 mV respectively, as mentioned in **Figure S1 (a)** and **S1 (b)**. Although there is no significant difference between the values of RCFA and SECFA. However, SECFA has less possibility to aggregate in colloidal form as it possesses more static charge (about 3.19%) than RCFA. The calculated sizes for RCFA and SECFA are 346.6 nm and 315.3 nm respectively as shown in **Figures S1 (c)** and **S1 (d)**. The smaller size of SECFA particles indicates that particular components from RCFA were removed during acidic-basic treatment, which is also mentioned in the XRD section. Both the smaller size and greater static charge on SECFA particles helped in providing more surface area of SECFA and less aggregation of particles which led to improved adsorption of the dye [1].
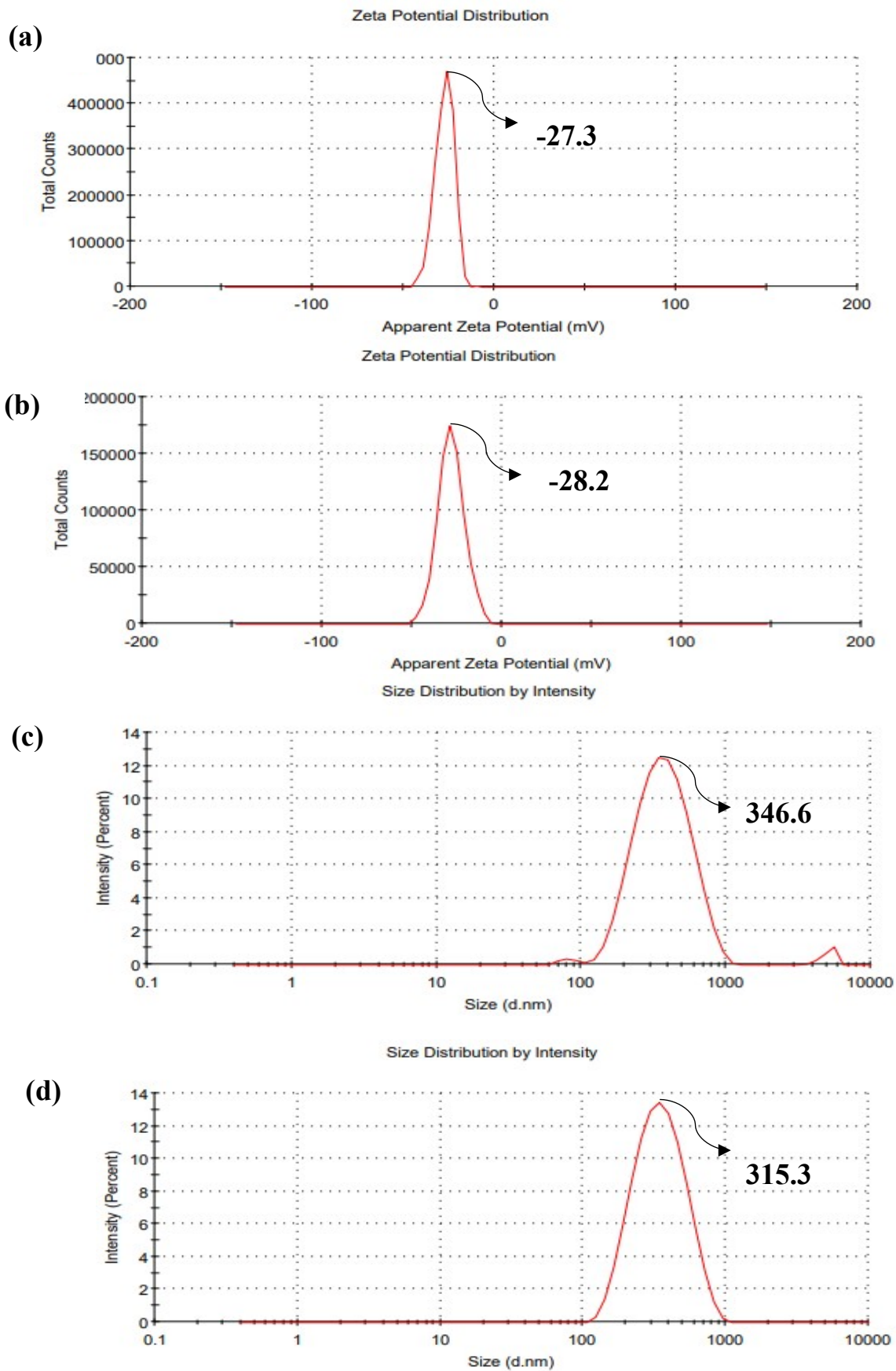
Figure S1: Zeta-measurements comparing RCFA and SECFA: Zeta-potentials of RCFA and SECFA are shown in (a) and (b), while Zeta sizers of RCFA and SECFA are shown in (c) and (d) respectively.
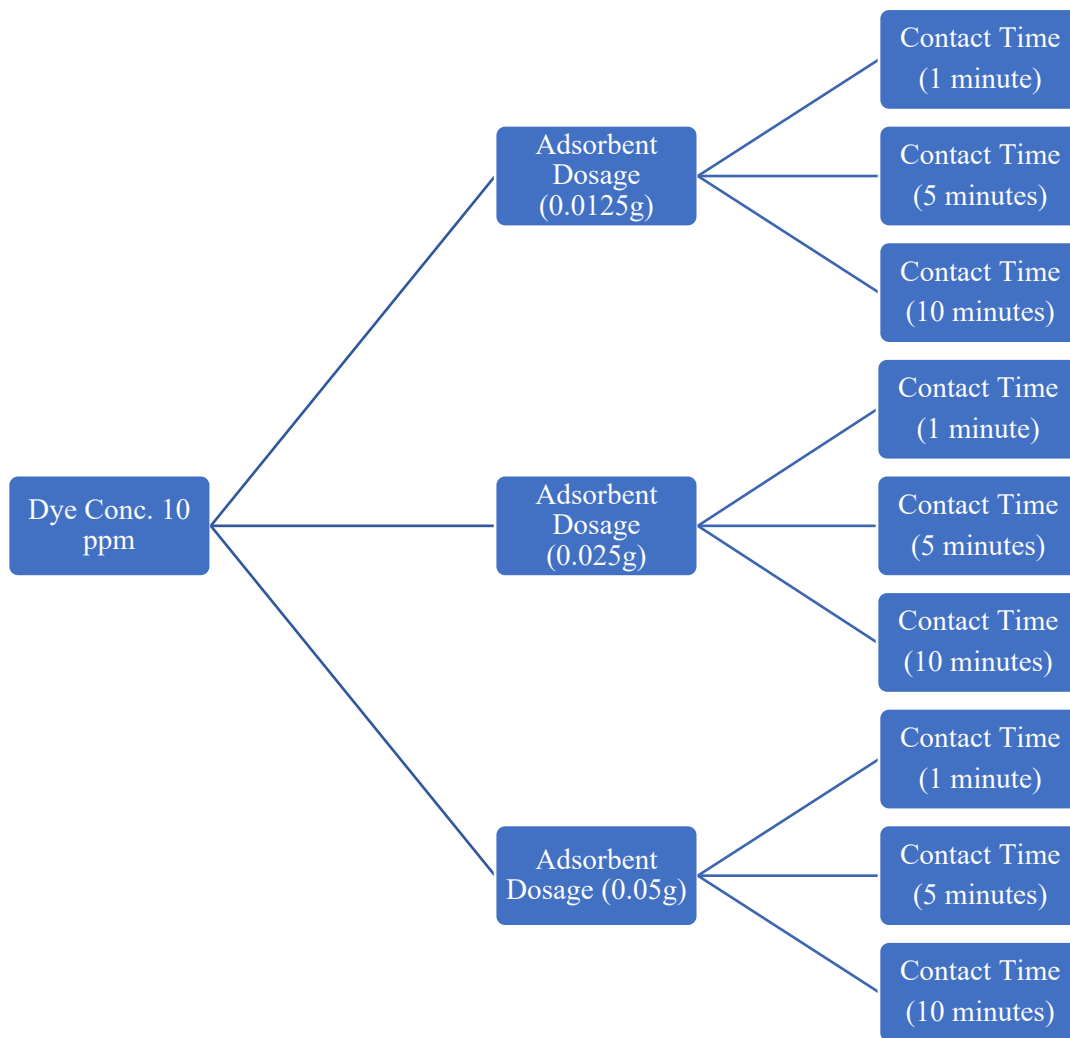
Scheme S1: Schematic diagram for 10 ppm dye concentration, and similar experiments have been performed for (20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,180,190 and 200) ppm dye concentrations for RCFA and SECFA separately.

(a)

Loaded RCFA

(b)
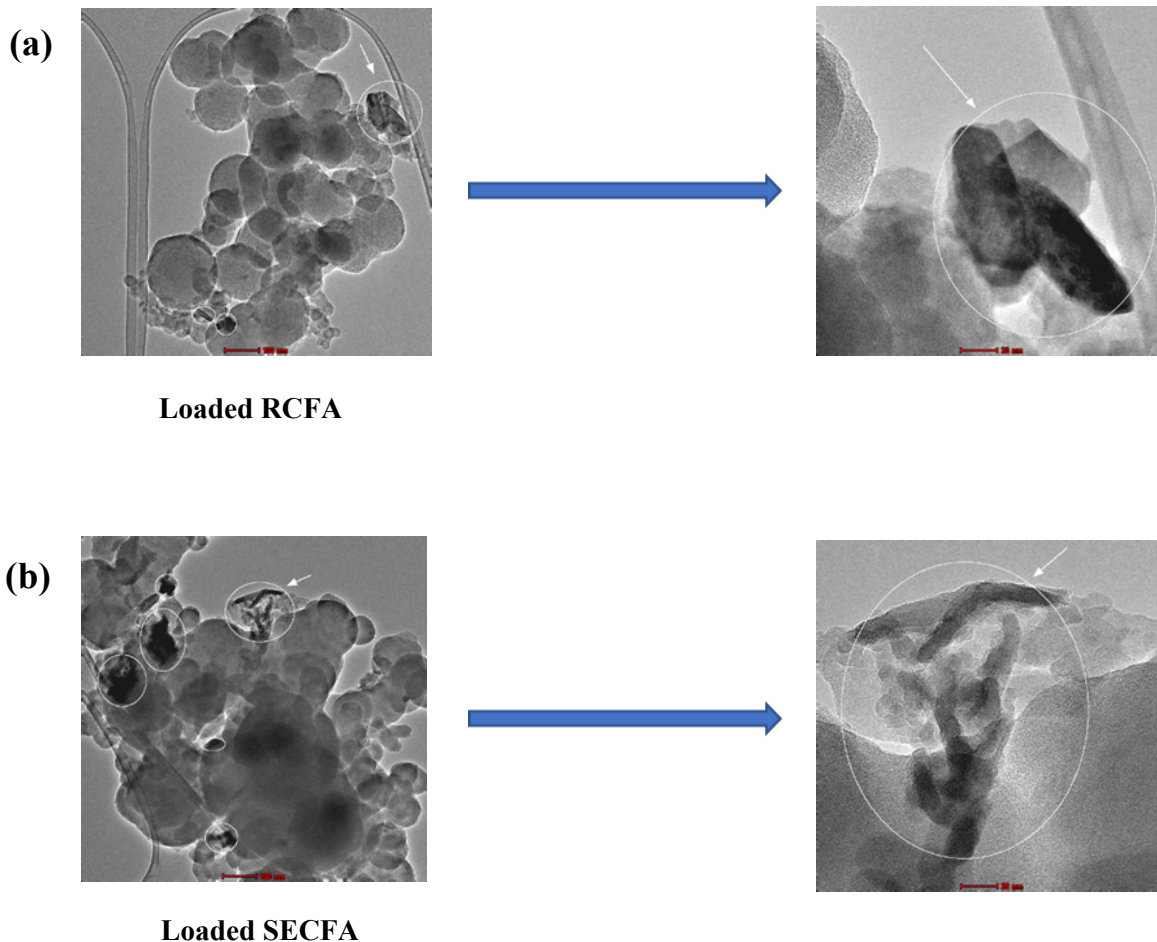
Loaded SECFA

Figure S2: Dye loaded surfaces of RCFA and SECFA in (a) and (b) respectively.

	Table S1: Experimental runs for RCFA					Table S2: Experimental runs for SECFA			
Runs	Dye conc. in ppm	RCFA dose	Contact time	% age dye removal	Runs	Dye conc. in ppm	SECFA dose	Contact time	% age dye removal
1	10	0.0125	1	81.5486	1	10	0.0125	1	97.5288
2	10	0.0125	1	79.8669	2	10	0.0125	1	97.5042
3	10	0.0125	5	89.1269	3	10	0.0125	5	97.8583
4	10	0.0125	5	87.0216	4	10	0.0125	5	98.0033
5	10	0.0125	10	96.2109	5	10	0.0125	10	98.1878
6	10	0.0125	10	94.3428	6	10	0.0125	10	98.3361
7	10	0.025	1	93.4102	7	10	0.025	1	98.1878
8	10	0.025	1	92.6789	8	10	0.025	1	98.1697
9	10	0.025	5	95.0577	9	10	0.025	5	98.5173
10	10	0.025	5	95.0083	10	10	0.025	5	98.3361
11	10	0.025	10	96.7051	11	10	0.025	10	98.3526
12	10	0.025	10	96.3394	12	10	0.025	10	98.6689
13	10	0.05	1	97.5288	13	10	0.05	1	98.0231
14	10	0.05	1	97.5042	14	10	0.05	1	98.0033
15	10	0.05	5	98.1878	15	10	0.05	5	98.3526
16	10	0.05	5	98.3361	16	10	0.05	5	98.1697
17	10	0.05	10	99.1763	17	10	0.05	10	98.5173
18	10	0.05	10	99.1681	18	10	0.05	10	99.168
19	20	0.0125	1	67.2587	19	20	0.0125	1	98.3784
20	20	0.0125	1	68.3564	20	20	0.0125	1	98.4639
21	20	0.0125	5	78.8417	21	20	0.0125	5	98.5328
22	20	0.0125	5	77.1889	22	20	0.0125	5	98.4639
23	20	0.0125	10	81.7761	23	20	0.0125	10	98.6873
24	20	0.0125	10	81.49	24	20	0.0125	10	98.7711
25	20	0.025	1	96.9112	25	20	0.025	1	98.9961
26	20	0.025	1	96.6206	26	20	0.025	1	99.0015
27	20	0.025	5	95.9073	27	20	0.025	5	99.0734
28	20	0.025	5	95.6221	28	20	0.025	5	99.0783

29	20	0.025	10	98.4556	29	20	0.025	10	99.0734
30	20	0.025	10	98.3103	30	20	0.025	10	99.1551
31	20	0.05	1	98.8417	31	20	0.05	1	98.9189
32	20	0.05	1	98.8479	32	20	0.05	1	99.0015
33	20	0.05	5	98.9961	33	20	0.05	5	98.9961
34	20	0.05	5	98.9247	34	20	0.05	5	99.0015
35	20	0.05	10	99.3822	35	20	0.05	10	99.1506
36	20	0.05	10	99.3088	36	20	0.05	10	99.1551
37	30	0.0125	1	55.456	37	30	0.0125	1	96.8371
38	30	0.0125	1	55.1471	38	30	0.0125	1	96.9538
39	30	0.0125	5	70.6906	39	30	0.0125	5	98.2077
40	30	0.0125	5	71.4811	40	30	0.0125	5	98.1618
41	30	0.0125	10	79.5994	41	30	0.0125	10	98.5767
42	30	0.0125	10	80.5147	42	30	0.0125	10	98.4244
43	30	0.025	1	93.0416	43	30	0.025	1	99.262
44	30	0.025	1	92.6996	44	30	0.025	1	99.2122
45	30	0.025	5	94.7812	45	30	0.025	5	99.262
46	30	0.025	5	94.9055	46	30	0.025	5	99.3172
47	30	0.025	10	97.048	47	30	0.025	10	99.3147
48	30	0.025	10	97.3739	48	30	0.025	10	99.3697
49	30	0.05	1	98.2604	49	30	0.05	1	99.262
50	30	0.05	1	98.3718	50	30	0.05	1	99.2122
51	30	0.05	5	98.8403	51	30	0.05	5	99.262
52	30	0.05	5	98.8445	52	30	0.05	5	99.3172
53	30	0.05	10	99.5256	53	30	0.05	10	99.262
54	30	0.05	10	99.4748	54	30	0.05	10	99.2647
55	40	0.0125	1	34.6186	55	40	0.0125	1	95.7711
56	40	0.0125	1	34.0637	56	40	0.0125	1	95.8661
57	40	0.0125	5	43.4909	57	40	0.0125	5	97.1393
58	40	0.0125	5	42.993	58	40	0.0125	5	97.1062
59	40	0.0125	10	53.7728	59	40	0.0125	10	98.01
60	40	0.0125	10	53.5345	60	40	0.0125	10	97.933
61	40	0.025	1	84.3284	61	40	0.025	1	99.2952
62	40	0.025	1	84.8698	62	40	0.025	1	99.2559
63	40	0.025	5	86.5672	63	40	0.025	5	99.3367
64	40	0.025	5	86.606	64	40	0.025	5	99.3386
65	40	0.025	10	88.806	65	40	0.025	10	99.4196
66	40	0.025	10	88.0529	66	40	0.025	10	99.3799
67	40	0.05	1	96.6418	67	40	0.05	1	99.3781
68	40	0.05	1	96.5688	68	40	0.05	1	99.3799
69	40	0.05	5	97.8027	69	40	0.05	5	99.3781
70	40	0.05	5	97.7263	70	40	0.05	5	99.4212
71	40	0.05	10	98.7148	71	40	0.05	10	99.4196
72	40	0.05	10	98.8012	72	40	0.05	10	99.3799
73	50	0.0125	1	29.366	73	50	0.0125	1	94.7491
74	50	0.0125	1	28.694	74	50	0.0125	1	94.8928
75	50	0.0125	5	36.6394	75	50	0.0125	5	97.0828
76	50	0.0125	5	36.0234	76	50	0.0125	5	96.9981
77	50	0.0125	10	44.6908	77	50	0.0125	10	97.394
78	50	0.0125	10	44.2105	78	50	0.0125	10	97.193
79	50	0.025	1	79.2688	79	50	0.025	1	99.2999
80	50	0.025	1	79.0253	80	50	0.025	1	99.2982
81	50	0.025	5	81.4858	81	50	0.025	5	99.2999
82	50	0.025	5	81.7154	82	50	0.025	5	99.3372
83	50	0.025	10	85.2587	83	50	0.025	10	99.3388
84	50	0.025	10	85.1852	84	50	0.025	10	99.3372
85	50	0.05	1	95.527	85	50	0.05	1	99.3777
86	50	0.05	1	95.3606	86	50	0.05	1	99.3762
87	50	0.05	5	96.7717	87	50	0.05	5	99.4166
88	50	0.05	5	96.9981	88	50	0.05	5	99.3762
89	50	0.05	10	98.2497	89	50	0.05	10	99.4555
90	50	0.05	10	98.0117	90	50	0.05	10	99.4152
91	60	0.0125	1	27.9731	91	60	0.0125	1	90.8003
92	60	0.0125	1	27.6286	92	60	0.0125	1	90.865
93	60	0.0125	5	35.7143	93	60	0.0125	5	95.1758

94	60	0.0125	5	36.2043	94	60	0.0125	5	95.1529
95	60	0.0125	10	39.2296	95	60	0.0125	10	95.8115
96	60	0.0125	10	40.1939	96	60	0.0125	10	95.6376
97	60	0.025	1	68.9978	97	60	0.025	1	99.0277
98	60	0.025	1	68.8665	98	60	0.025	1	99.0679
99	60	0.025	5	73.5602	99	60	0.025	5	99.1025
100	60	0.025	5	73.1916	100	60	0.025	5	99.1797
101	60	0.025	10	78.1227	101	60	0.025	10	99.1399
102	60	0.025	10	78.7099	102	60	0.025	10	99.1797
103	60	0.05	1	93.6799	103	60	0.05	1	99.3642
104	60	0.05	1	93.5123	104	60	0.05	1	99.3289
105	60	0.05	5	95.9237	105	60	0.05	5	99.4016
106	60	0.05	5	95.824	106	60	0.05	5	99.4034
107	60	0.05	10	97.4944	107	60	0.05	10	99.439
108	60	0.05	10	97.39	108	60	0.05	10	99.4034
109	70	0.0125	1	22.9893	109	70	0.0125	1	87.477
110	70	0.0125	1	23.745	110	70	0.0125	1	87.5412
111	70	0.0125	5	28.1675	111	70	0.0125	5	91.3698
112	70	0.0125	5	27.4826	112	70	0.0125	5	91.2056
113	70	0.0125	10	30.3342	113	70	0.0125	10	92.8021
114	70	0.0125	10	30.7072	114	70	0.0125	10	92.4881
115	70	0.025	1	58.9056	115	70	0.025	1	98.7147
116	70	0.025	1	58.7028	116	70	0.025	1	98.6442
117	70	0.025	5	67.0217	117	70	0.025	5	98.8248
118	70	0.025	5	67.6805	118	70	0.025	5	98.7541
119	70	0.025	10	69.8127	119	70	0.025	10	98.8615
120	70	0.025	10	70.5387	120	70	0.025	10	98.9007
121	70	0.05	1	90.0477	121	70	0.05	1	99.339
122	70	0.05	1	89.7765	122	70	0.05	1	99.3404
123	70	0.05	5	91.7371	123	70	0.05	5	99.339
124	70	0.05	5	91.6086	124	70	0.05	5	99.4137
125	70	0.05	10	93.6467	125	70	0.05	10	99.3757
126	70	0.05	10	93.6607	126	70	0.05	10	99.3771
127	80	0.0125	1	13.5303	127	80	0.0125	1	85.8862
128	80	0.0125	1	12.8383	128	80	0.0125	1	85.8449
129	80	0.0125	5	19.329	129	80	0.0125	5	90.0438
130	80	0.0125	5	18.7637	130	80	0.0125	5	89.7586
131	80	0.0125	10	23.0853	131	80	0.0125	10	91.3202
132	80	0.0125	10	22.5311	132	80	0.0125	10	91.1485
133	80	0.025	1	48.6506	133	80	0.025	1	98.1036
134	80	0.025	1	48.2809	134	80	0.025	1	98.1712
135	80	0.025	5	55.9446	135	80	0.025	5	98.6871
136	80	0.025	5	55.4133	136	80	0.025	5	98.6832
137	80	0.025	10	64.2961	137	80	0.025	10	98.7965
138	80	0.025	10	63.0212	138	80	0.025	10	98.9027
139	80	0.05	1	82.6039	139	80	0.05	1	99.2706
140	80	0.05	1	82.297	140	80	0.05	1	99.2319
141	80	0.05	5	88.1838	141	80	0.05	5	99.3071
142	80	0.05	5	88.259	142	80	0.05	5	99.3416
143	80	0.05	10	89.8614	143	80	0.05	10	99.3071
144	80	0.05	10	89.7586	144	80	0.05	10	99.2685
145	90	0.0125	1	7.51634	145	90	0.0125	1	85.1489
146	90	0.0125	1	7.36152	146	90	0.0125	1	85.0583
147	90	0.0125	5	11.329	147	90	0.0125	5	89.252
148	90	0.0125	5	10.7507	148	90	0.0125	5	89.0671
149	90	0.0125	10	12.6362	149	90	0.0125	10	90.305
150	90	0.0125	10	11.8805	150	90	0.0125	10	90.0146
151	90	0.025	1	40.1598	151	90	0.025	1	97.8577
152	90	0.025	1	39.723	152	90	0.025	1	97.8134
153	90	0.025	5	46.0058	153	90	0.025	5	98.1481
154	90	0.025	5	45.7726	154	90	0.025	5	98.1778
155	90	0.025	10	51.8519	155	90	0.025	10	98.2934
156	90	0.025	10	51.6764	156	90	0.025	10	98.1778
157	90	0.05	1	77.6688	157	90	0.05	1	99.2375
158	90	0.05	1	77.5875	158	90	0.05	1	99.2711

159	90	0.05	5	84.35	159	90	0.05	5	99.2738
160	90	0.05	5	84.4023	160	90	0.05	5	99.3076
161	90	0.05	10	86.4561	161	90	0.05	10	99.3101
162	90	0.05	10	86.8076	162	90	0.05	10	99.2347
163	100	0.0125	1	3.65545	163	100	0.0125	1	81.578
164	100	0.0125	1	3.71573	164	100	0.0125	1	81.4214
165	100	0.0125	5	3.76402	165	100	0.0125	5	88.2374
166	100	0.0125	5	5.73593	166	100	0.0125	5	88.1313
167	100	0.0125	10	5.86319	167	100	0.0125	10	89.2146
168	100	0.0125	10	6.42136	168	100	0.0125	10	89.1775
169	100	0.025	1	31.7771	169	100	0.025	1	97.3579
170	100	0.025	1	31.6739	170	100	0.025	1	97.2944
171	100	0.025	5	37.8936	171	100	0.025	5	97.9008
172	100	0.025	5	38.0952	172	100	0.025	5	97.8355
173	100	0.025	10	44.1911	173	100	0.025	10	98.0456
174	100	0.025	10	44.1919	174	100	0.025	10	97.8716
175	100	0.05	1	72.4575	175	100	0.05	1	99.2038
176	100	0.05	1	72.583	176	100	0.05	1	99.1703
177	100	0.05	5	81.4694	177	100	0.05	5	99.24
178	100	0.05	5	81.9625	178	100	0.05	5	99.2424
179	100	0.05	10	84.3286	179	100	0.05	10	99.2761
180	100	0.05	10	83.9105	180	100	0.05	10	99.2785
181	110	0.0125	1	3.39473	181	110	0.0125	1	80.2456
182	110	0.0125	1	3.88629	182	110	0.0125	1	80.2087
183	110	0.0125	5	2.70856	183	110	0.0125	5	86.0599
184	110	0.0125	5	2.77078	184	110	0.0125	5	85.9302
185	110	0.0125	10	3.64753	185	110	0.0125	10	87.8295
186	110	0.0125	10	3.74235	186	110	0.0125	10	87.7654
187	110	0.025	1	19.8628	187	110	0.025	1	96.533
188	110	0.025	1	19.6474	188	110	0.025	1	96.5455
189	110	0.025	5	25.8577	189	110	0.025	5	96.8942
190	110	0.025	5	26.3404	190	110	0.025	5	96.7254
191	110	0.025	10	31.8527	191	110	0.025	10	97.147
192	110	0.025	10	32.0979	192	110	0.025	10	96.9773
193	110	0.05	1	64.3554	193	110	0.05	1	99.1333
194	110	0.05	1	63.7639	194	110	0.05	1	99.1724
195	110	0.05	5	75.8758	195	110	0.05	5	99.1694
196	110	0.05	5	75.1349	196	110	0.05	5	99.2803
197	110	0.05	10	77.5731	197	110	0.05	10	99.2055
198	110	0.05	10	77.294	198	110	0.05	10	99.1724
199	120	0.0125	1	1.80505	199	120	0.0125	1	79.1336
200	120	0.0125	1	2.33561	200	120	0.0125	1	79.1592
201	120	0.0125	5	2.02166	201	120	0.0125	5	84.5487
202	120	0.0125	5	2.58714	202	120	0.0125	5	84.549
203	120	0.0125	10	2.20217	203	120	0.0125	10	85.9928
204	120	0.0125	10	2.659	204	120	0.0125	10	86.0582
205	120	0.025	1	14.0072	205	120	0.025	1	96.1733
206	120	0.025	1	14.8042	206	120	0.025	1	96.0474
207	120	0.025	5	17.9061	207	120	0.025	5	96.4982
208	120	0.025	5	18.613	208	120	0.025	5	96.4068
209	120	0.025	10	20.1805	209	120	0.025	10	96.4982
210	120	0.025	10	20.9486	210	120	0.025	10	96.4068
211	120	0.05	1	58.4116	211	120	0.05	1	99.0253
212	120	0.05	1	58.8214	212	120	0.05	1	98.9939
213	120	0.05	5	65.5957	213	120	0.05	5	99.0614
214	120	0.05	5	66.0438	214	120	0.05	5	99.0658
215	120	0.05	10	72.13	215	120	0.05	10	99.0614
216	120	0.05	10	72.0086	216	120	0.05	10	99.1017
217	130	0.0125	1	1.8044	217	130	0.0125	1	78.3111
218	130	0.0125	1	1.8732	218	130	0.0125	1	78.062
219	130	0.0125	5	1.91267	219	130	0.0125	5	82.5695
220	130	0.0125	5	2.12536	220	130	0.0125	5	82.6009
221	130	0.0125	10	2.16528	221	130	0.0125	10	84.0491
222	130	0.0125	10	2.41354	222	130	0.0125	10	84.1499
223	130	0.025	1	8.51678	223	130	0.025	1	94.6229

224	130	0.025	1	8.82565	224	130	0.025	1	94.5965
225	130	0.025	5	13.0639	225	130	0.025	5	95.1642
226	130	0.025	5	12.8602	226	130	0.025	5	94.9207
227	130	0.025	10	15.59	227	130	0.025	10	95.4168
228	130	0.025	10	15.1297	228	130	0.025	10	95.9294
229	130	0.05	1	54.8178	229	130	0.05	1	98.9534
230	130	0.05	1	54.8991	230	130	0.05	1	98.9193
231	130	0.05	5	60.3031	231	130	0.05	5	98.9534
232	130	0.05	5	57.4928	232	130	0.05	5	98.9193
233	130	0.05	10	67.6651	233	130	0.05	10	98.9895
234	130	0.05	10	67.7594	234	130	0.05	10	99.0634
235	140	0.0125	1	1.73098	235	140	0.0125	1	77.1367
236	140	0.0125	1	2.08558	236	140	0.0125	1	77.3463
237	140	0.0125	5	1.94735	237	140	0.0125	5	81.1756
238	140	0.0125	5	2.33729	238	140	0.0125	5	81.2298
239	140	0.0125	10	1.98341	239	140	0.0125	10	82.1132
240	140	0.0125	10	2.19346	240	140	0.0125	10	81.913
241	140	0.025	1	8.07789	241	140	0.025	1	93.7252
242	140	0.025	1	8.30636	242	140	0.025	1	93.7433
243	140	0.025	5	8.94338	243	140	0.025	5	94.2661
244	140	0.025	5	9.20532	244	140	0.025	5	94.1028
245	140	0.025	10	9.62856	245	140	0.025	10	94.6628
246	140	0.025	10	9.78065	246	140	0.025	10	94.5703
247	140	0.05	1	47.6019	247	140	0.05	1	98.8821
248	140	0.05	1	47.7526	248	140	0.05	1	98.8134
249	140	0.05	5	56.5453	249	140	0.05	5	98.8821
250	140	0.05	5	57.0658	250	140	0.05	5	98.9213
251	140	0.05	10	61.8824	251	140	0.05	10	98.9181
252	140	0.05	10	61.8842	252	140	0.05	10	98.9572
253	150	0.0125	1	1.6943	253	150	0.0125	1	76.0274
254	150	0.0125	1	1.55179	254	150	0.0125	1	75.821
255	150	0.0125	5	2.05479	255	150	0.0125	5	79.1637
256	150	0.0125	5	1.91267	256	150	0.0125	5	79.0689
257	150	0.0125	10	1.9106	257	150	0.0125	10	81.1103
258	150	0.0125	10	2.02093	258	150	0.0125	10	80.8733
259	150	0.025	1	7.4261	259	150	0.025	1	92.8262
260	150	0.025	1	7.32588	260	150	0.025	1	92.7824
261	150	0.025	5	8.72386	261	150	0.025	5	93.5833
262	150	0.025	5	8.58896	262	150	0.025	5	93.3959
263	150	0.025	10	9.01226	263	150	0.025	10	93.9077
264	150	0.025	10	9.02201	264	150	0.025	10	93.865
265	150	0.05	1	44.088	265	150	0.05	1	98.5941
266	150	0.05	1	43.847	266	150	0.05	1	98.5565
267	150	0.05	5	50.9373	267	150	0.05	5	98.6662
268	150	0.05	5	50.4872	268	150	0.05	5	98.7369
269	150	0.05	10	58.5797	269	150	0.05	10	98.7383
270	150	0.05	10	58.4987	270	150	0.05	10	98.8091
271	160	0.0125	1	1.76386	271	160	0.0125	1	75.414
272	160	0.0125	1	1.55067	272	160	0.0125	1	75.3696
273	160	0.0125	5	2.08783	273	160	0.0125	5	77.8978
274	160	0.0125	5	1.87523	274	160	0.0125	5	77.5694
275	160	0.0125	10	2.23182	275	160	0.0125	10	79.1937
276	160	0.0125	10	2.05554	276	160	0.0125	10	79.084
277	160	0.025	1	6.83945	277	160	0.025	1	90.6767
278	160	0.025	1	6.52723	278	160	0.025	1	90.4436
279	160	0.025	5	7.4514	279	160	0.025	5	92.0446
280	160	0.025	5	7.35665	280	160	0.025	5	92.0303
281	160	0.025	10	7.59539	281	160	0.025	10	93.0166
282	160	0.025	10	7.42878	282	160	0.025	10	92.6794
283	160	0.05	1	41.1087	283	160	0.05	1	97.9482
284	160	0.05	1	40.8943	284	160	0.05	1	97.8363
285	160	0.05	5	47.3002	285	160	0.05	5	98.1641
286	160	0.05	5	47.2052	286	160	0.05	5	98.1969
287	160	0.05	10	51.4399	287	160	0.05	10	98.3081
288	160	0.05	10	51.6769	288	160	0.05	10	98.1969

289	170	0.0125	1	1.69126
290	170	0.0125	1	1.47748
291	170	0.0125	5	2.08708
292	170	0.0125	5	1.83784
293	170	0.0125	10	2.19503
294	170	0.0125	10	2.01802
295	170	0.025	1	6.33321
296	170	0.025	1	6.12613
297	170	0.025	5	6.69306
298	170	0.025	5	6.41441
299	170	0.025	10	7.08888
300	170	0.025	10	6.88288
301	170	0.05	1	29.2191
302	170	0.05	1	28.3604
303	170	0.05	5	39.0788
304	170	0.05	5	38.7387
305	170	0.05	10	45.2321
306	170	0.05	10	44.8288
307	180	0.0125	1	1.72476
308	180	0.0125	1	1.72476
309	180	0.0125	5	2.08408
310	180	0.0125	5	2.12001
311	180	0.0125	10	2.22781
312	180	0.0125	10	2.19188
313	180	0.025	1	4.38376
314	180	0.025	1	4.85088
315	180	0.025	5	4.67122
316	180	0.025	5	4.77902
317	180	0.025	10	4.88681
318	180	0.025	10	4.74308
319	180	0.05	1	22.9249
320	180	0.05	1	23.1764
321	180	0.05	5	33.2016
322	180	0.05	5	32.2673
323	180	0.05	10	36.7589
324	180	0.05	10	36.4714
325	190	0.0125	1	1.75943
326	190	0.0125	1	1.7229
327	190	0.0125	5	2.11849
328	190	0.0125	5	2.11773
329	190	0.0125	10	2.19031
330	190	0.0125	10	2.18952
331	190	0.025	1	3.44704
332	190	0.025	1	3.73295
333	190	0.025	5	4.09336
334	190	0.025	5	4.16368
335	190	0.025	10	4.3447
336	190	0.025	10	4.34314
337	190	0.05	1	18.5278
338	190	0.05	1	18.5212
339	190	0.05	5	24.5601
340	190	0.05	5	25.0179
341	190	0.05	10	32.9623
342	190	0.05	10	32.8428
343	200	0.0125	1	1.7934
344	200	0.0125	1	1.7569
345	200	0.0125	5	2.15208
346	200	0.0125	5	2.15131
347	200	0.0125	10	2.22382
348	200	0.0125	10	2.29473
349	200	0.025	1	3.12052
350	200	0.025	1	2.86841
351	200	0.025	5	3.55093
352	200	0.025	5	3.5138
353	200	0.025	10	3.94548

289	170	0.0125	1	74.6312
290	170	0.0125	1	74.7748
291	170	0.0125	5	76.3584
292	170	0.0125	5	76.1081
293	170	0.0125	10	77.4379
294	170	0.0125	10	77.1532
295	170	0.025	1	89.4926
296	170	0.025	1	88.973
297	170	0.025	5	90.7521
298	170	0.025	5	90.4144
299	170	0.025	10	91.3998
300	170	0.025	10	91.2793
301	170	0.05	1	96.8694
302	170	0.05	1	96.7568
303	170	0.05	5	97.769
304	170	0.05	5	97.8378
305	170	0.05	10	98.0569
306	170	0.05	10	97.9099
307	180	0.0125	1	73.9849
308	180	0.0125	1	73.949
309	180	0.0125	5	75.2425
310	180	0.0125	5	75.0629
311	180	0.0125	10	76.3564
312	180	0.0125	10	76.0331
313	180	0.025	1	88.2501
314	180	0.025	1	88.1423
315	180	0.025	5	89.3281
316	180	0.025	5	89.2203
317	180	0.025	10	90.0467
318	180	0.025	10	89.9389
319	180	0.05	1	96.6942
320	180	0.05	1	96.7661
321	180	0.05	5	97.3051
322	180	0.05	5	97.1613
323	180	0.05	10	97.9878
324	180	0.05	10	98.1315
325	190	0.0125	1	73.6804
326	190	0.0125	1	73.6181
327	190	0.0125	5	74.3268
328	190	0.0125	5	74.0129
329	190	0.0125	10	71.5978
330	190	0.0125	10	74.8744
331	190	0.025	1	86.6786
332	190	0.025	1	86.7193
333	190	0.025	5	88.0072
334	190	0.025	5	88.2268
335	190	0.025	10	89.1921
336	190	0.025	10	88.837
337	190	0.05	1	96.553
338	190	0.05	1	96.4824
339	190	0.05	5	97.0916
340	190	0.05	5	96.9849
341	190	0.05	10	97.5943
342	190	0.05	10	97.4874
343	200	0.0125	1	73.4577
344	200	0.0125	1	73.6106
345	200	0.0125	5	73.8881
346	200	0.0125	5	73.754
347	200	0.0125	10	74.3185
348	200	0.0125	10	74.2202
349	200	0.025	1	84.9713
350	200	0.025	1	84.9408
351	200	0.025	5	86.693
352	200	0.025	5	86.877
353	200	0.025	10	87.9842

354	200	0.025	10	3.90821
355	200	0.05	1	15.4591
356	200	0.05	1	15.3819
357	200	0.05	5	16.2482
358	200	0.05	5	15.9914
359	200	0.05	10	22.9197
360	200	0.05	10	22.8756

354	200	0.025	10	88.0244
355	200	0.05	1	96.3773
356	200	0.05	1	96.2711
357	200	0.05	5	96.5567
358	200	0.05	5	96.7372
359	200	0.05	10	96.9871
360	200	0.05	10	96.9165

Table S3: Langmuir isotherm values using RCFA and SECFA adsorbents

RCFA LANGMUIR ISOTHERM								
Contact time (minutes)	1			5			10		
Dosage (g)	0.0125	0.025	0.05	0.0125	0.025	0.05	0.0125	0.025	0.05
Slope	0.4801	0.3288	0.1332	0.3982	0.2905	0.1146	0.3757	0.2725	0.0874
Intercept	-10.1844	-7.4252	-1.3674	-6.8907	-6.3033	-1.0684	-7.6640	-5.5631	-0.5177
q_{max} (mg/g)	2.0825	3.0409	7.5030	2.5111	3.4413	8.7244	2.6616	3.6697	11.4377
K_L (L/mg)	-0.2044	-0.4095	-5.4867	-0.3644	-0.5459	-8.1653	-0.3472	-0.6596	-22.0903
R^2	0.8920	0.8432	0.9010	0.8709	0.8525	0.8572	0.8811	0.8615	0.9229
R^2 mean	ΣR^2/ total no. of R^2								
-	0.8758								
SECFA LANGMUIR ISOTHERM								
Contact time	1 minute			5 minutes			10 minutes		
Dosage (g)	0.0125	0.025	0.05	0.0125	0.025	0.05	0.0125	0.025	0.05
Slope	0.0083	0.0144	0.0223	0.0083	0.0141	0.0213	0.0083	0.0139	0.0203
Intercept	0.0750	0.0276	0.0316	0.0486	0.0247	0.0299	0.0419	0.0234	0.0292
q_{max} (mg/g)	120.3369	69.3481	44.8028	119.6172	70.5716	46.8164	119.6172	71.5307	49.1159
K_L (L/mg)	1604.0648	2505.3514	1415.1253	2461.7663	2852.5315	1562.6328	2854.8263	3058.1769	1678.0291
R^2	0.9316	0.9928	0.9002	0.9729	0.9920	0.8922	0.9797	0.9913	0.8814
R^2 mean	ΣR^2/ total no. of R^2								
-	0.9428								

Table S4: Freundlich isotherm values using RCFA and SECFA adsorbents

RCFA FREUNDLICH ISOTHERM								
Contact time	1 minute			5 minutes			10 minutes		
Dosage (g)	0.0125	0.025	0.05	0.0125	0.025	0.05	0.0125	0.025	0.05
Slope	-0.4336	-0.1371	0.1450	-0.3859	-0.1101	0.1687	-0.3247	-0.0864	0.1826
Intercept	1.4353	1.0665	0.8011	1.4117	1.0727	0.8376	1.40144	1.0633	0.8800
1/n	-0.4336	-0.1371	0.1450	-0.3859	-0.1101	0.1687	-0.3247	-0.0864	0.1826
K_f	27.2464	11.6570	6.3260	25.8095	11.8230	6.8810	25.2022	11.5701	7.5859
R^2	0.4501	0.0963	0.3368	0.3879	0.0483	0.4432	0.2261	0.0194	0.6084
R^2 mean	ΣR^2/ total no. of R^2								

-	0.2907								
SECFA FREUNDLICH ISOTHERM									
Contact time	1 minute			5 minutes			10 minutes		
Dosage (g)	0.0125	0.025	0.05	0.0125	0.025	0.05	0.0125	0.025	0.05
Slope	0.4153	0.4027	0.5809	0.3948	0.4067	0.6101	0.3872	0.4110	0.6447
Intercept	1.3238	1.3321	1.2115	1.4058	1.3544	1.2374	1.4339	1.3671	1.2562
$1/n$	0.4153	0.4027	0.5809	0.3948	0.4067	0.6101	0.3872	0.4110	0.6447
K_f	21.0799	21.4822	16.2745	25.4589	22.6198	17.2742	27.1612	23.2905	18.0401
R^2	0.9653	0.8338	0.7621	0.9464	0.8361	0.7850	0.9461	0.8386	0.8202
R^2 mean	ΣR^2/ total no. of R^2								
-	0.8592								

Table S5: For the determination of spontaneity of the adsorption process

ppm	RCFA Dosage						SECFA Dosage					
	0.0125g		0.025g		0.05g		0.0125g		0.025g		0.05g	
	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$	$K_1(min^{-1})$	$\Delta G(kJmol^{-1})$
10	0.1761795	-14.445723	0.211853	-13.988885	0.1494877	-14.852761	0.2027792	-14.097341	0.3466245	-12.769054	0.2291255	-13.7947
20	0.3350635	-12.853098	0.1204699	-15.387456	0.0656125	-16.892914	0.0719227	-16.665408	0.2747018	-13.345227	0.0558017	-17.294185
30	0.2538136	-13.541169	0.1515604	-14.818644	0.1469775	-14.894718	0.081457	-16.35700	0.1733238	-14.486211	0.1733238	-14.486211
40	0.1544852	-14.771287	0.1829734	-14.351978	0.1933369	-14.21548	0.2327412	-13.755908	0.1733238	-14.486211	0.141773	-14.98400
50	0.160404	-14.678139	0.1293365	-15.211505	0.1921163	-14.231171	0.5699234	-11.537056	0.1733238	-14.486211	0.1013781	-15.814944
60	0.2888192	-13.221065	0.1580319	-14.715051	0.2243122	-13.847301	0.5418959	-11.661996	0.4480256	-12.133288	0.3466245	-12.769054
70	0.2439798	-13.639069	0.3482597	-12.757394	0.1590222	-14.699574	0.3327374	-12.870358	0.1971598	-14.166968	0.984878	-10.181786
80	0.234883	-13.733212	0.1610027	-14.668907	0.3833344	-12.519648	0.3483518	-12.756738	0.3666606	-12.629827	0.1733238	-14.486211
90	0.3438149	-12.789218	0.1748668	-14.464252	0.3461409	-12.772513	0.4051438	-12.382553	0.4262623	-12.25666	0.1733238	-14.486211
100	0.1422333	-14.976009	0.1747747	-14.465558	0.3936288	-12.45399	0.5073739	-11.825083	0.4865548	-11.92889	0.2291255	-13.7947
110	0.7180524	-10.964637	0.1830885	-14.35042	0.4842288	-11.940763	0.3588304	-12.68331	0.1820982	-14.363857	0.1733238	-14.486211
120	0.2624959	-13.457835	0.2457301	-13.621359	0.1917248	-14.236226	0.3847392	-12.510585	1.1022388	-9.9028581	0.3466245	-12.769054
130	0.14465143	-14.9342	0.2565081	-13.515005	0.0943079	-15.994054	0.3406137	-12.812394	0.1305801	-15.187796	0.0021248	-25.391214
140	0.3666606	-12.629827	0.2189002	-13.907811	0.2572681	-13.507675	0.4433505	-12.159277	0.1784825	-14.413546	0.2291255	-13.7947
150	0.7490738	-10.859848	0.3788435	-12.548844	0.1554064	-14.756557	0.2485398	-13.593191	0.2508658	-13.570112	0.2529385	-13.549726
160	0.2747018	-13.345227	0.5093085	-11.815655	0.2242431	-13.848064	0.2452465	-13.62624	0.259433	-13.486915	0.4024262	-12.399227
170	0.3220285	-12.951408	0.1399303	-15.016454	0.2439568	-13.639303	0.2231146	-13.860564	0.2561627	-13.518344	0.4680387	-12.025017
180	0.3760799	-12.566984	0.1971598	-14.166968	0.3129086	-13.022586	0.1899975	-14.258647	0.2291255	-13.7947	0.1188809	-15.420354
190	0.4582279	-12.077502	0.3132541	-13.019852	0.1430624	-14.961609	0.0286954	-18.941939	0.2369787	-13.711204	0.1777455	-14.423797
200	0.3760799	-12.566984	0.2151002	-13.951198	0.02455	-19.328502	0.1236941	-15.322019	0.2291255	-13.7947	0.1805552	-14.38494

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