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APPENDICES

APPENDIX A

Table A1 Data from calculation of surface charge of SCP

Sample	pH	Surface charge (C/g)
1	4.14	30.773
2	4.45	15.411
3	5.60	11.457
4	6.11	2.228
5	6.35	-2.515
6	6.65	-11.868
7	6.79	-23.676
8	7.43	-48.194

Table A2 Data from calculation of surface charge of AM-SCP

Sample	pH	Surface charge (C/g)
1	5.10	46.334
2	6.02	23.661
3	6.86	12.047
4	7.50	2.481
5	8.02	-2.162
6	8.56	-10.968
7	9.03	-21.118
8	9.47	-41.130

Table A3 Data from calculation of surface charge of MP-SCP

Sample	pH	Surface charge (C/g)
1	3.90	17.878
2	4.27	11.059
3	4.82	8.411
4	5.47	1.596
5	6.01	-2.646
6	6.31	-11.937
7	7.33	-23.613
8	8.33	-47.735

APPENDIX B

Table B1 Data from Adsorption kinetic of Cu(II) on SCP, AM-SCP and MP-SCP at pH3

Time(hr)	Concentration of Cu(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.888	4.892	4.375
0.167	4.857	4.808	4.359
0.25	4.848	4.845	4.436
0.5	4.871	4.773	4.345
1	4.823	4.690	4.083
3	4.787	4.508	3.781
5	4.728	4.400	3.642
12	4.646	4.269	3.376
18	4.631	4.213	3.345
24	4.658	4.278	3.314

Table B2 Data from Adsorption kinetic of Cd(II) on SCP, AM-SCP and MP-SCP at pH3

Time(hr)	Concentration of Cd(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.938	4.450	4.437
0.167	4.879	4.348	4.440
0.25	4.857	4.141	4.470
0.5	4.833	4.038	4.514
1	4.845	4.205	4.449
3	4.780	4.048	4.395
5	4.755	4.128	4.268
12	4.732	4.049	4.203
18	4.723	4.124	4.192
24	4.737	4.126	4.234

Table B3 Data from Adsorption kinetic of Pb(II) on SCP, AM-SCP and MP-SCP at pH3

Time(hr)	Concentration of Pb(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.955	4.964	4.985
0.167	4.977	4.861	4.968
0.25	4.950	4.810	4.981
0.5	4.945	4.755	4.705
1	4.893	4.736	4.680
3	4.869	4.703	4.632
5	4.851	4.686	4.488
12	4.855	4.632	4.447
18	4.802	4.610	4.399
24	4.829	4.595	4.389

Table B4 Data from Adsorption kinetic of Cu(II) on SCP, AM-SCP and MP-SCP at pH5

Time(hr)	Concentration of Cu(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.858	4.692	4.375
0.167	4.757	4.608	4.359
0.25	4.718	4.545	4.436
0.5	4.471	4.573	4.495
1	4.423	4.290	4.183
3	4.587	3.808	3.905
5	4.358	3.700	3.742
12	4.346	3.469	2.866
18	4.251	3.513	2.645
24	4.438	3.478	2.514

Table B5 Data from Adsorption kinetic of Cd(II) on SCP, AM-SCP and MP-SCP at pH5

Time(hr)	Concentration of Cd(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.838	4.750	4.437
0.167	4.789	4.684	4.440
0.25	4.737	4.641	4.470
0.5	4.733	4.638	4.514
1	4.675	4.605	4.449
3	4.620	4.548	4.395
5	4.615	4.513	4.268
12	4.532	4.449	4.203
18	4.523	4.424	4.192
24	4.517	4.426	4.234

Table B6 Data from Adsorption kinetic of Pb(II) on SCP, AM-SCP and MP-SCP at pH5

Time(hr)	Concentration of Pb(II) after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	5.000	5.000	5.000
0.083	4.655	4.664	4.785
0.167	4.497	4.461	4.968
0.25	4.550	4.310	4.807
0.5	4.445	4.255	4.605
1	4.383	4.316	4.480
3	4.369	4.183	4.532
5	4.391	4.226	4.388
12	4.275	4.132	4.147
18	4.302	4.100	4.219
24	4.293	4.125	4.189

Table B7 Data from Adsorption kinetic of AB on SCP, AM-SCP and MP-SCP at pH5

Time(hr)	Concentration of AB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	46.083	36.083	48.583
0.167	44.667	34.083	48.750
0.25	44.583	34.750	48.667
0.5	45.083	35.917	48.167
1	43.500	34.167	47.333
3	44.083	34.750	47.750
5	43.333	33.667	48.083
12	44.083	33.500	47.667
18	43.667	33.250	48.167
24	45.750	35.583	47.917

Table B8 Data from Adsorption kinetic of AB on SCP, AM-SCP and MP-SCP at pH7

Time(hr)	Concentration of AB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	44.500	38.083	47.917
0.167	44.417	37.750	47.083
0.25	44.667	37.667	46.333
0.5	44.333	37.583	48.083
1	45.750	36.750	46.917
3	44.333	37.750	47.667
5	44.583	36.667	46.750
12	46.083	37.500	45.667
18	45.667	36.823	46.917
24	45.083	38.917	48.250

Table B9 Data from Adsorption kinetic of AB on SCP, AM-SCP and MP-SCP at pH9

Time(hr)	Concentration of AB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	48.667	47.458	47.667
0.167	49.083	46.750	48.333
0.25	48.917	46.667	48.083
0.5	48.667	47.083	48.583
1	48.583	45.917	48.750
3	48.825	46.250	47.917
5	48.783	46.750	48.250
12	48.750	45.667	47.500
18	49.083	46.167	48.167
24	49.167	46.500	47.333

Table B10 Data from Adsorption kinetic of MB on SCP, AM-SCP and MP-SCP at pH5

Time(hr)	Concentration of MB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	46.143	46.071	43.500
0.167	44.643	45.500	43.571
0.25	44.571	46.000	42.214
0.5	44.500	45.357	42.500
1	43.500	44.929	42.143
3	44.214	44.857	42.929
5	44.357	45.214	43.000
12	44.000	44.875	43.143
18	43.857	45.357	42.214
24	45.357	45.857	42.857

Table B11 Data from Adsorption kinetic of MB on SCP, AM-SCP and MP-SCP at pH7

Time(hr)	Concentration of MB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	41.357	42.500	39.857
0.167	40.135	41.929	39.214
0.25	40.214	41.143	39.357
0.5	40.929	41.357	38.500
1	40.857	42.071	39.143
3	40.357	41.929	38.929
5	39.857	42.143	39.071
12	40.143	41.357	38.857
18	40.214	41.214	38.143
24	40.500	42.071	38.929

Table B12 Data from Adsorption kinetic of MB on SCP, AM-SCP and MP-SCP at pH9

Time(hr)	Concentration of MB after adsorption (mg/l)		
	SCP	AM-SCP	MP-SCP
0	50.000	50.000	50.000
0.083	36.214	47.357	33.214
0.167	36.929	46.214	33.929
0.25	37.143	46.143	34.143
0.5	36.071	47.071	33.071
1	36.857	45.929	33.857
3	35.929	46.357	32.929
5	35.071	46.429	33.071
12	36.429	45.857	33.429
18	37.071	46.143	34.071
24	35.357	46.429	33.357

Table B13 Data from Adsorption isotherm of Cu(II) on SCP, AM-SCP and MP-SCP at pH3

Initial concentration (mg/l)	Adsorption capacity of Cu(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.202	0.509	1.255
1	0.411	0.896	1.615
3	0.645	2.087	3.990
5	1.518	2.794	7.086
7	1.866	3.123	8.270
10	2.295	3.919	9.097

Table B14 Data from Adsorption isotherm of Cd(II) on SCP, AM-SCP and MP-SCP at pH3

Initial concentration (mg/l)	Adsorption capacity of Cd(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.123	0.072	0.123
1	0.238	0.338	0.238
3	0.618	0.509	0.618
5	1.295	1.112	1.295
7	1.561	1.904	1.561
10	1.733	2.372	1.733

Table B15 Data from Adsorption isotherm of Pb(II) on SCP, AM-SCP and MP-SCP at pH3

Initial concentration (mg/l)	Adsorption capacity of Pb(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.200	0.418	0.515
1	0.223	0.526	0.621
3	0.379	0.880	1.382
5	0.611	1.690	2.677
7	0.958	2.360	3.451
10	1.097	2.687	4.085

Table B16 Data from Adsorption isotherm of Cu(II) on SCP, AM-SCP and MP-SCP at pH5

Initial concentration (mg/l)	Adsorption capacity of Cu(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.480	1.543	1.693
1	0.563	1.666	2.018
3	1.655	3.065	5.295
5	2.777	6.511	10.276
7	3.301	9.914	11.683
10	4.820	10.749	13.206

Table B17 Data from Adsorption isotherm of Cd(II) on SCP, AM-SCP and MP-SCP at pH5

Initial concentration (mg/l)	Adsorption capacity of Cd(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.255	0.456	0.976
1	0.658	0.872	1.362
3	1.198	1.966	2.341
5	2.290	3.058	3.842
7	3.316	4.712	5.708
10	3.840	5.510	6.116

Table B18 Data from Adsorption isotherm of Pb(II) on SCP, AM-SCP and MP-SCP at pH5

Initial concentration (mg/l)	Adsorption capacity of Pb(II) (mg/g)		
	SCP	AM-SCP	MP-SCP
0.5	0.477	0.514	0.669
1	0.720	1.127	1.179
3	1.258	1.942	2.155
5	2.393	3.305	3.301
7	3.287	3.993	4.377
10	3.728	4.518	4.750

Table B19 Data from Adsorption isotherm of AB on SCP, AM-SCP and MP-SCP at pH5

Initial concentration (mg/l)	Adsorption capacity of AB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	6.675	14.604	2.629
10	11.757	23.750	6.807
30	17.500	43.250	9.792
50	19.812	46.000	10.714
70	20.024	47.857	12.255
100	21.458	49.505	12.376

Table B20 Data from Adsorption isotherm of AB on SCP, AM-SCP and MP-SCP at pH7

Initial concentration (mg/l)	Adsorption capacity of AB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	6.151	14.216	4.289
10	8.213	20.750	5.461
30	14.297	37.990	8.293
50	15.675	42.961	9.395
70	18.125	45.250	9.127
100	19.431	45.000	10.833

Table B21 Data from Adsorption isotherm of AB on SCP, AM-SCP and MP-SCP at pH9

Initial concentration (mg/l)	Adsorption capacity of AB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	3.713	8.095	4.207
10	4.792	12.500	6.151
30	6.289	16.500	8.870
50	7.917	17.822	10.031
70	8.542	18.873	10.903
100	8.681	19.417	11.757

Table B22 Data from Adsorption isotherm of MB on SCP, AM-SCP and MP-SCP at pH5

Initial concentration (mg/l)	Adsorption capacity of MB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	10.714	8.750	11.730
10	11.096	9.104	12.907
30	14.080	10.402	15.430
50	18.034	13.140	21.747
70	24.098	17.682	27.661
100	33.750	29.762	41.964

Table B23 Data from Adsorption isotherm of MB on SCP, AM-SCP and MP-SCP at pH7

Initial concentration (mg/l)	Adsorption capacity of MB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	10.950	7.857	12.321
10	15.559	12.730	18.382
30	24.098	21.040	25.850
50	30.112	24.510	36.573
70	37.260	35.179	44.209
100	54.932	49.107	62.765

Table B24 Data from Adsorption isotherm of MB on SCP, AM-SCP and MP-SCP at pH9

Initial concentration (mg/l)	Adsorption capacity of MB (mg/g)		
	SCP	AM-SCP	MP-SCP
5	11.846	9.464	12.321
10	17.327	10.608	20.458
30	28.302	12.191	33.789
50	32.074	13.831	42.857
70	45.518	25.385	57.248
100	72.843	50.824	89.286

APPENDIX C

Table C1 Data from pseudo-first order model of Cu(II) on SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.658	1.712	1.712	0.000	1440		0.0001	0.008	1.577
5	4.631		0.295	1.417	1080	0.151			
5	4.646		0.283	1.429	720	0.155			
5	4.728		0.218	1.494	300	0.174			
5	4.787		0.171	1.541	180	0.188			
5	4.823		0.141	1.571	60	0.196			
5	4.871		0.103	1.609	30	0.207			
5	4.848		0.122	1.590	15	0.201			
5	4.857		0.115	1.597	10	0.203			
5	4.888		0.090	1.622	5	0.210			
5	5.000		0.000	1.712	0	0.234			

Table C2 Data from pseudo-first order model of Cu(II) on AM-SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.278	3.611	3.611	0.000	1440		0.0028	0.166	0.892
5	4.313		3.437	0.174	1080	-0.759			
5	4.269		3.657	-0.046	720				
5	4.400		3.002	0.610	300	-0.215			
5	4.508		2.459	1.153	180	0.062			
5	4.690		1.551	2.060	60	0.314			
5	4.773		1.133	2.478	30	0.394			
5	4.845		0.778	2.834	15	0.452			
5	4.808		0.958	2.653	10	0.424			
5	4.892		0.539	3.072	5	0.487			
5	5.000		0.000	3.611	0	0.558			

Table C3 Data from pseudo-first order model of Cu(II) on MP-SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	3.714	6.431	6.431	0.000	1440		0.0005	0.028	0.014
5	3.745		6.277	0.154	1080	-0.812			
5	3.776		6.118	0.313	720	-0.505			
5	3.942		5.290	1.141	300	0.057			
5	4.181		4.098	2.333	180	0.368			
5	4.208		3.959	2.472	60	0.393			
5	4.345		3.274	3.157	30	0.499			
5	4.436		2.819	3.612	15	0.558			
5	4.459		2.707	3.724	10	0.571			
5	4.575		2.124	4.307	5	0.634			
5	5.000		0.000	6.431	0	0.808			

Table C4 Data from pseudo-first order model of Pb(II) on SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.802	0.993	0.993	0.000	1440		0.0021	0.124	0.672
5	4.829		0.854	0.139	1080	-0.857			
5	4.855		0.727	0.265	720	-0.576			
5	4.851		0.744	0.248	300	-0.605			
5	4.869		0.657	0.336	180	-0.474			
5	4.893		0.533	0.459	60	-0.338			
5	4.945		0.275	0.718	30	-0.144			
5	4.950		0.253	0.740	15	-0.131			
5	4.977		0.116	0.877	10	-0.057			
5	4.955		0.226	0.766	5	-0.115			
5	5.000		0.000	0.993	0	-0.003			

Table C5 Data from pseudo-first order model of Pb(II) on AM-SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.595	2.027	2.027	0.000	1440		0.0005	0.028	0.600
5	4.610		1.953	0.074	1080	-1.131			
5	4.632		1.842	0.185	720	-0.733			
5	4.686		1.571	0.456	300	-0.341			
5	4.703		1.484	0.542	180	-0.266			
5	4.736		1.321	0.706	60	-0.151			
5	4.755		1.226	0.801	30	-0.097			
5	4.810		0.949	1.078	15	0.032			
5	4.861		0.694	1.332	10	0.125			
5	4.964		0.181	1.846	5	0.266			
5	5.000		0.000	2.027	0	0.307			

Table C6 Data from pseudo-first order model of Pb(II) on MP-SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.389	3.056	3.056	0.000	1440		0.0012	0.069	0.670
5	4.399		3.004	0.052	1080	-1.284			
5	4.447		2.766	0.290	720	-0.538			
5	4.488		2.562	0.493	300	-0.307			
5	4.632		1.839	1.217	180	0.085			
5	4.680		1.601	1.455	60	0.163			
5	4.705		1.473	1.583	30	0.199			
5	4.981		0.097	2.959	15	0.471			
5	4.968		0.161	2.895	10	0.462			
5	4.985		0.076	2.980	5	0.474			
5	5.000		0.000	3.056	0	0.485			

Table C7 Data from pseudo-first order model of Cd(II) on SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.723	1.384	1.384	0.000	1440		0.0002	0.014	0.661
5	4.737		1.315	0.069	1080	-1.158			
5	4.732		1.342	0.043	720	-1.372			
5	4.755		1.224	0.160	300	-0.796			
5	4.780		1.098	0.286	180	-0.544			
5	4.845		0.774	0.610	60	-0.215			
5	4.833		0.833	0.551	30	-0.259			
5	4.857		0.717	0.667	15	-0.176			
5	4.879		0.606	0.778	10	-0.109			
5	4.938		0.311	1.073	5	0.030			
5	5.000		0.000	1.384	0	0.141			

Table C8 Data from pseudo-first order model of Cd(II) on AM-SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	4.666	1.672	1.672	0.000	1440		0.0152	0.912	6.377
5	4.654		1.728	-0.056	1080	-			
5	4.669		1.656	0.016	720	-1.783			
5	4.673		1.636	0.036	300	-1.444			
5	4.688		1.558	0.114	180	-0.943			
5	4.705		1.477	0.195	60	-0.709			
5	4.738		1.309	0.363	30	-0.439			
5	4.741		1.297	0.376	15	-0.425			
5	4.788		1.058	0.614	10	-0.212			
5	4.890		0.552	1.120	5	0.049			
5	5.000		0.000	1.672	0	0.223			

Table C9 Data from pseudo-first order model of Cd(II) on MP-SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.604	1.983	1.983	0.000	1440		0.0055	0.332	1.903
5	4.592		2.042	-0.059	1080	-			
5	4.603		1.984	-0.001	720	-			
5	4.668		1.661	0.322	300	-0.492			
5	4.695		1.526	0.457	180	-0.340			
5	4.749		1.257	0.725	60	-0.139			
5	4.814		0.931	1.052	30	0.022			
5	4.870		0.652	1.331	15	0.124			
5	4.840		0.798	1.185	10	0.074			
5	4.937		0.313	1.670	5	0.223			
5	5.000		0.000	1.983	0	0.297			

Table C10 Data from pseudo-first order model of Cu(II) on SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.438	2.812	2.812	0.000	1440		0.0002	0.014	0.896
5	4.251		0.599	2.213	1080	0.345			
5	4.346		0.523	2.289	720	0.360			
5	4.358		0.514	2.298	300	0.361			
5	4.587		0.331	2.481	180	0.395			
5	4.423		0.461	2.351	60	0.371			
5	4.471		0.423	2.389	30	0.378			
5	4.718		0.226	2.586	15	0.413			
5	4.757		0.195	2.617	10	0.418			
5	4.858		0.114	2.698	5	0.431			
5	5.000		0.000	2.812	0	0.449			

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Table C11 Data from pseudo-first order model of Cu(II) on AM-SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	3.478	7.611	7.611	0.000	1440		0.0035	0.207	0.333
5	3.513		7.437	0.174	1080	-0.759			
5	3.469		7.657	-0.045	720	-			
5	3.700		6.502	1.110	300	0.045			
5	3.808		5.959	1.653	180	0.218			
5	4.290		3.551	4.060	60	0.609			
5	4.573		2.133	5.478	30	0.739			
5	4.545		2.278	5.334	15	0.727			
5	4.608		1.958	5.653	10	0.752			
5	4.692		1.539	6.072	5	0.783			
5	5.000		0.000	7.611	0	0.881			

Table C12 Data from pseudo-first order model of Cu(II) on MP-SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	q _e -q _t	Time (min)	log(q _e - q _t)	k ₁ (1/min)	k ₁ (1/hr)	q _e
5	2.514	12.431	12.431	0.000	1440		0.0025	0.152	0.022
5	2.645		11.777	0.654	1080	-0.184			
5	2.866		10.668	1.763	720	0.246			
5	3.742		6.290	6.141	300	0.788			
5	3.905		5.475	6.956	180	0.842			
5	4.183		4.085	8.346	60	0.921			
5	4.495		2.524	9.907	30	0.996			
5	4.436		2.819	9.612	15	0.983			
5	4.359		3.207	9.224	10	0.965			
5	4.375		3.124	9.307	5	0.969			
5	5.000		0.000	12.431	0	1.094			

Table C13 Data from pseudo-first order model of Pb(II) on SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.293	3.535	3.535	0.000	1440		0.0032	0.193	2.564
5	4.302		3.493	0.042	1080	-1.372			
5	4.275		3.623	-0.088	720	-			
5	4.391		3.044	0.491	300	-0.309			
5	4.369		3.157	0.378	180	-0.422			
5	4.383		3.083	0.452	60	-0.345			
5	4.445		2.775	0.760	30	-0.119			
5	4.550		2.253	1.283	15	0.108			
5	4.497		2.516	1.019	10	0.008			
5	4.655		1.726	1.809	5	0.257			
5	5.000		0.000	3.535	0	0.548			

Table C14 Data from pseudo-first order model of Pb(II) on AM-SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.125	4.377	4.377	0.000	1440		0.0053	0.318	1.580
5	4.100		4.503	-0.126	1080	-			
5	4.132		4.342	0.035	720	-1.456			
5	4.226		3.871	0.506	300	-0.296			
5	4.183		4.084	0.293	180	-0.534			
5	4.316		3.421	0.956	60	-0.020			
5	4.255		3.726	0.651	30	-0.187			
5	4.310		3.449	0.928	15	-0.033			
5	4.461		2.695	1.682	10	0.226			
5	4.664		1.681	2.696	5	0.431			
5	5.000		0.000	4.377	0	0.641			

Table C15 Data from pseudo-first order model of Pb(II) on MP-SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.189	4.056	4.056	0.000	1440		0.0028	0.166	0.785
5	4.219		3.904	0.152	1080	-0.818			
5	4.147		4.266	-0.210	720	-			
5	4.388		3.062	0.994	300	-0.003			
5	4.532		2.339	1.717	180	0.235			
5	4.480		2.601	1.455	60	0.163			
5	4.605		1.973	2.083	30	0.319			
5	4.807		0.965	3.091	15	0.490			
5	4.968		0.161	3.895	10	0.590			
5	4.785		1.076	2.980	5	0.474			
5	5.000		0.000	4.056	0	0.608			

Table C16 Data from pseudo-first order model of Cd(II) on SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.217	3.915	3.915	0.000	1440		0.0210	1.257	1.810
5	4.323		3.384	0.531	1080	-			
5	4.132		4.342	-0.427	720	-			
5	4.115		4.424	-0.510	300	-			
5	4.220		3.898	0.016	180	-1.782			
5	4.155		4.225	-0.310	60	-			
5	4.033		4.833	-0.918	30	-			
5	4.207		3.967	-0.053	15	-			
5	4.139		4.306	-0.391	10	-			
5	4.238		3.812	0.103	5	-0.987			
5	5.000		0.000	3.915	0	0.593			

Table C17 Data from pseudo-first order model of Cd(II) on AM-SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.426	2.872	2.872	0.000	1440		0.0007	0.041	6.377
5	4.424		2.878	1.494	1080	0.174			
5	4.449		2.756	1.617	720	0.209			
5	4.513		2.436	1.936	300	0.287			
5	4.548		2.258	2.114	180	0.325			
5	4.605		1.977	2.396	60	0.379			
5	4.638		1.809	2.564	30	0.409			
5	4.641		1.797	2.576	15	0.411			
5	4.684		1.580	2.792	10	0.446			
5	4.750		1.252	3.120	5	0.494			
5	5.000		0.000	4.372	0	0.641			

Table C18 Data from pseudo-first order model of Cd(II) on MP-SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
5	4.234	3.833	3.833	0.000	1440		0.0067	0.401	1.526
5	4.192		4.042	-0.209	1080	-			
5	4.203		3.984	-0.152	720	-			
5	4.268		3.661	0.172	300	-0.764			
5	4.395		3.026	0.807	180	-0.093			
5	4.449		2.757	1.076	60	0.032			
5	4.514		2.431	1.402	30	0.147			
5	4.470		2.652	1.181	15	0.072			
5	4.440		2.798	1.035	10	0.015			
5	4.437		2.813	1.020	5	0.008			
5	5.000		0.000	3.833	0	0.583			

Table C19 Data from pseudo-first order model of AB on SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	43.333	22.223	22.223	0.000	1440		0.0016	0.097	3.393
50	43.667		21.110	1.113	1080	0.047			
50	44.083		19.723	2.500	720	0.398			
50	45.750		14.167	8.057	300	0.906			
50	44.083		19.723	2.500	180	0.398			
50	43.500		21.667	0.557	60	-			
50	45.083		16.390	5.833	30	0.766			
50	44.583		18.057	4.167	15	0.620			
50	44.667		17.777	4.447	10	0.648			
50	46.083		13.057	9.167	5	0.962			
50	50.000		0.000	22.223	0	1.347			

Table C20 Data from pseudo-first order model of AB on AM-SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	33.250	55.833	55.833	0.000	1440		0.0035	0.207	6.324
50	35.583		48.057	7.777	1080	-			
50	33.500		55.000	0.833	720	-0.079			
50	33.667		54.443	1.390	300	0.143			
50	34.750		50.833	5.000	180	0.699			
50	34.167		52.777	3.057	60	0.485			
50	35.917		46.943	8.890	30	0.949			
50	34.750		50.833	5.000	15	0.699			
50	34.083		53.057	2.777	10	0.444			
50	36.083		46.390	9.443	5	0.975			
50	50.000		0.000	55.833	0	1.747			

Table C21 Data from pseudo-first order model of AB on MP-SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	47.917	6.943	6.943	0.000	1440		0.0012	0.069	1.098
50	48.167		6.110	0.830	1080	-0.081			
50	47.667		7.777	-0.837	720	-			
50	48.083		6.390	0.550	300	-0.260			
50	47.750		7.500	-0.560	180	-			
50	47.333		8.890	-1.950	60	-			
50	48.167		6.110	0.830	30	-0.081			
50	48.667		4.443	2.497	15	0.397			
50	48.750		4.167	2.773	10	0.443			
50	48.583		4.723	2.217	5	0.346			
50	50.000		0.000	6.940	0	0.841			

Table C22 Data from pseudo-first order model of AB on SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	44.333	18.890	18.890	0.000	1440		0.0007	0.041	0.2525
50	45.083		16.390	2.500	1080	0.398			
50	45.667		14.443	4.447	720	0.648			
50	46.083		13.057	5.833	300	0.766			
50	44.583		18.057	0.833	180	-			
50	45.750		14.167	4.723	60	0.674			
50	44.333		18.890	0.000	30	-			
50	44.667		17.777	1.113	15	-			
50	44.417		18.610	0.280	10	-			
50	44.500		18.333	0.557	5	-			
50	50.000		0.000	18.890	0	-			

Table C23 Data from pseudo-first order model of AB on AM-SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	36.823	43.923	43.923	0.000	1440		0.0316	1.893	0.032
50	37.500		41.667	2.257	1080	0.353			
50	36.667		44.443	-0.520	720	-			
50	37.750		40.833	3.090	300	0.490			
50	36.750		44.167	-0.243	180	-			
50	37.583		41.390	2.533	60	0.404			
50	37.667		41.110	2.813	30	0.449			
50	37.750		40.833	3.090	15	0.490			
50	38.083		39.723	4.200	10	0.623			
50	38.917		36.943	6.980	5	0.844			
50	50.000		0.000	43.923	0	1.643			

Table C24 Data from pseudo-first order model of AB on MP-SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	45.667	14.443	14.443	0.000	1440		0.0007	0.041	0.02922
50	46.917		10.277	4.157	1080	0.619			
50	48.250		5.833	8.600	720	0.934			
50	46.750		10.833	3.600	300	-			
50	47.667		7.777	6.657	180	0.823			
50	46.917		10.277	4.157	60	-			
50	48.083		6.390	8.043	30	0.905			
50	46.333		12.223	2.210	15	-			
50	47.083		9.723	4.710	10	-			
50	47.917		6.943	7.490	5	0.874			
50	50.000		0.000	14.433	0	1.159			

Table C25 Data from pseudo-first order model of AB on SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	48.667	4.443	4.443	0.000	1440		0.0283	1.700	1.576
50	49.083		3.057	1.387	1080	0.142			
50	48.917		3.610	0.833	720	-0.079			
50	48.667		4.443	0.000	300	-			
50	48.583		4.723	-0.280	180	-			
50	48.825		3.917	0.527	60	-0.278			
50	48.783		4.057	0.387	30	-0.413			
50	48.750		4.167	0.277	15	-0.558			
50	49.083		3.057	1.387	10	0.142			
50	49.167		2.777	1.667	5	0.222			
50	50.000		0.000	4.443	0	0.648			

Table C26 Data from pseudo-first order model of AB on AM-SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	46.500	11.667	11.667	0.000	1440		0.0511	3.068	0.560
50	46.167		12.777	-1.110	1080	-			
50	45.667		14.443	-2.777	720	-			
50	46.750		10.833	0.833	300	-0.079			
50	46.250		12.500	-0.833	180	-			
50	45.917		13.610	-1.943	60	-			
50	47.083		9.723	1.943	30	0.289			
50	46.667		11.110	0.557	15	-0.254			
50	46.750		10.833	0.833	10	-0.079			
50	47.458		8.473	3.193	5	0.504			
50	50.000		0.000	11.667	0	1.067			

Table C27 Data from pseudo-first order model of AB on MP-SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	47.333	8.890	8.890	0.000	1440		0.0028	0.166	0.416
50	48.167		6.110	2.780	1080	-			
50	47.500		8.333	0.557	720	-0.254			
50	48.250		5.833	3.057	300	0.485			
50	47.917		6.943	1.947	180	0.289			
50	48.750		4.167	4.723	60	0.674			
50	48.583		4.723	4.167	30	0.620			
50	48.083		6.390	2.500	15	0.398			
50	48.333		5.557	3.333	10	0.523			
50	47.667		7.777	1.113	5	-			
50	50.000		0.000	8.890	0	0.949			

Table C28 Data from pseudo-first order model of MB on SCP at pH5

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	43.857	20.477	20.477	0.000	1440		0.0032	0.193	0.498
50	44.643		17.857	2.620	1080	-			
50	44.000		20.000	0.477	720	-0.322			
50	44.357		18.810	1.667	300	0.222			
50	44.214		19.287	1.190	180	0.076			
50	43.500		21.667	-1.190	60	-			
50	44.500		18.333	2.143	30	0.331			
50	44.571		18.097	2.380	15	0.377			
50	45.357		15.477	5.000	10	0.699			
50	46.143		12.857	7.620	5	0.882			
50	50.000		0.000	20.477	0	1.311			

Table C29 Data from pseudo-first order model of MB on AM-SCP at pH5

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	44.875	17.083	17.083	0.000	1440		0.0039	0.235	0.459
50	45.357		15.477	1.607	1080	-			
50	44.875		17.083	0.000	720	-			
50	45.214		15.953	1.130	300	0.053			
50	45.857		13.810	3.273	180	0.515			
50	44.929		16.903	0.180	60	-			
50	45.357		15.477	1.607	30	0.206			
50	46.000		13.333	3.750	15	0.574			
50	45.500		15.000	2.083	10	0.319			
50	46.071		13.097	3.987	5	0.601			
50	50.000		0.000	17.083	0	1.233			

Table C30 Data from pseudo-first order model of MB on MP-SCP at pH5

Initial MB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	42.857	23.810	23.810	0.000	1440		0.0081	0.484	0.902
50	42.214		25.953	-2.143	1080	-			
50	43.143		22.857	0.953	720	-0.021			
50	43.000		23.333	0.477	300	-0.322			
50	42.929		23.570	0.240	180	-0.620			
50	42.143		26.190	-2.380	60	-			
50	42.500		25.000	-1.190	30	-			
50	42.214		25.953	-2.143	15	-			
50	43.571		21.430	2.380	10	0.377			
50	43.500		21.667	2.143	5	0.331			
50	50.000		0.000	23.810	0	1.377			

Table C31 Data from pseudo-first order model of MB on SCP at pH7

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	41.214	29.287	29.287	0.000	1440		0.0018	0.111	0.322
50	41.357		28.810	0.477	1080	-0.322			
50	42.143		26.190	3.097	720	0.491			
50	41.929		26.903	2.383	300	0.377			
50	42.071		26.430	2.857	180	0.456			
50	41.357		28.810	0.477	60	-			
50	41.143		29.523	-0.237	30	-			
50	41.929		26.903	2.383	15	0.377			
50	42.071		26.430	2.857	10	0.456			
50	42.500		25.000	4.287	5	0.632			
50	50.000		0.000	29.287	0	1.467			

Table C32 Data from pseudo-first order model of MB on AM-SCP at pH7

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	40.135	32.883	32.883	0.000	1440		0.0021	0.124	0.454
50	40.214		32.620	0.263	1080	-0.579			
50	40.929		30.237	2.647	720	0.423			
50	40.857		30.477	2.407	300	0.381			
50	40.357		32.143	0.740	180	-0.131			
50	39.857		33.810	-0.927	60	-			
50	40.143		32.857	0.027	30	-			
50	40.214		32.620	0.263	15	-			
50	40.500		31.667	1.217	10	0.085			
50	41.357		28.810	4.073	5	0.610			
50	50.000		0.000	32.883	0	1.517			

Table C33 Data from pseudo-first order model of MB on MP-SCP at pH7

Initial MB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	38.143	39.523	39.523	0.000	1440		0.0012	0.069	0.221
50	38.857		37.143	2.380	1080	0.377			
50	39.071		36.430	3.093	720	0.490			
50	38.929		36.903	2.620	300	0.418			
50	39.143		36.190	3.333	180	0.523			
50	38.500		38.333	1.190	60	-			
50	38.929		36.903	2.620	30	-			
50	39.357		35.477	4.047	15	0.607			
50	39.214		35.953	3.570	10	0.553			
50	39.857		33.810	5.713	5	0.757			
50	50.000		0.000	39.523	0	1.597			

Table C34 Data from pseudo-first order model of MB on SCP at pH9

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe- qt)	k1 (1/min)	k1 (1/hr)	qe
50	35.357	48.810	48.810	0.000	1440		0.0085	0.511	0.139
50	37.071		43.097	5.713	1080	-			
50	36.429		45.237	3.573	720	-			
50	35.071		49.763	-0.953	300	-			
50	35.929		46.903	1.907	180	0.280			
50	36.857		43.810	5.000	60	0.699			
50	36.071		46.430	2.380	30	0.377			
50	37.143		42.857	5.953	15	0.775			
50	36.929		43.570	5.240	10	0.719			
50	36.214		45.953	2.857	5	0.456			
50	50.000		0.000	48.810	0	1.689			

Table C35 Data from pseudo-first order model of MB on AM-SCP at pH9

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	46.143	12.857	12.857	0.000	1440		0.0018	0.111	0.814
50	46.429		11.903	0.683	1080	-0.165			
50	45.857		13.810	-1.223	720	-			
50	46.429		11.903	0.683	300	-0.165			
50	46.357		12.143	0.443	180	-0.353			
50	45.929		13.570	-0.983	60	-			
50	47.071		9.763	2.823	30	0.451			
50	46.143		12.857	-0.270	15	-			
50	46.214		12.620	-0.033	10	-			
50	47.357		8.810	3.777	5	0.577			
50	50.000		0.000	12.587	0	1.100			

Table C36 Data from pseudo-first order model of MB on MP-SCP at pH9

Initial MB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	qe-qt	Time (min)	log(qe-qt)	k1 (1/min)	k1 (1/hr)	qe
50	32.929	56.903	56.903	0.000	1440		0.0007	0.041	0.038
50	33.357		55.477	4.427	1080	0.646			
50	34.071		53.097	6.807	720	0.833			
50	33.429		55.237	4.667	300	0.669			
50	33.071		56.430	3.473	180	0.541			
50	33.857		53.810	6.093	60	0.785			
50	33.071		56.430	3.473	30	-			
50	34.143		52.857	7.047	15	0.848			
50	33.929		53.570	6.333	10	0.802			
50	33.214		55.953	3.950	5	-			
50	50.000		0.000	59.903	0	1.777			

Table C37 Data from pseudo-second order model of Cu(II) on SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.658	1.712	1.712		1440	0.0053	0.321	1.125
5	4.631		1.845	585.525	1080			
5	4.646		1.772	406.435	720			
5	4.728		1.362	220.264	300			
5	4.787		1.068	168.618	180			
5	4.823		0.883	67.950	60			
5	4.871		0.644	46.620	30			
5	4.848		0.762	19.698	15			
5	4.857		0.717	13.957	10			
5	4.888		0.561	8.913	5			
5	5.000		0.000		0			

Table C38 Data from pseudo- second order model of Cu(II) on AM-SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.278	3.611	3.611		1440	0.0014	0.081	1.095
5	4.313		3.437	314.228	1080			
5	4.269		3.657	196.910	720			
5	4.400		3.002	99.950	300			
5	4.508		2.459	73.215	180			
5	4.690		1.551	38.685	60			
5	4.773		1.133	26.478	30			
5	4.845		0.778	19.293	15			
5	4.808		0.958	10.438	10			
5	4.892		0.539	9.276	5			
5	5.000		0.000		0			

Table C39 Data from pseudo- second order model of Cu(II) on MP-SCP at pH3

Initial Cu (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	3.714	6.431	6.431		1440	0.0007	0.043	1.738
5	3.745		6.277	172.070	1080			
5	3.776		6.118	117.686	720			
5	3.942		5.290	56.716	300			
5	4.181		4.098	43.929	180			
5	4.208		3.959	15.157	60			
5	4.345		3.274	9.163	30			
5	4.436		2.819	5.322	15			
5	4.459		2.707	3.695	10			
5	4.575		2.124	2.354	5			
5	5.000		0.000		0			

Table C40 Data from pseudo- second order model of Pb(II) on SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.802	0.993	0.993		1440	0.0311	1.866	1.331
5	4.829		0.854	1265.378	1080			
5	4.855		0.727	990.371	720			
5	4.851		0.744	403.117	300			
5	4.869		0.657	274.181	180			
5	4.893		0.533	112.570	60			
5	4.945		0.275	109.091	30			
5	4.950		0.253	59.406	15			
5	4.977		0.116	86.207	10			
5	4.955		0.226	22.124	5			
5	5.000		0.000		0			

Table C41 Data from pseudo- second order model of Pb(II) on AM-SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.595	2.027	2.027		1440	0.0071	0.426	1.654
5	4.610		1.953	553.137	1080			
5	4.632		1.842	390.986	720			
5	4.686		1.571	191.022	300			
5	4.703		1.484	121.294	180			
5	4.736		1.321	45.437	60			
5	4.755		1.226	24.470	30			
5	4.810		0.949	15.806	15			
5	4.861		0.694	14.399	10			
5	4.964		0.181	27.701	5			
5	5.000		0.000		0			

Table C42 Data from pseudo- second order model of Pb(II) on MP-SCP at pH3

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.389	3.056	3.056		1440	0.0007	0.040	0.401
5	4.399		3.004	359.580	1080			
5	4.447		2.766	260.351	720			
5	4.488		2.562	117.096	300			
5	4.632		1.839	97.906	180			
5	4.680		1.601	37.488	60			
5	4.705		1.473	20.367	30			
5	4.981		0.097	155.440	15			
5	4.968		0.161	62.112	10			
5	4.985		0.076	66.225	5			
5	5.000		0.000		0			

Table C43 Data from pseudo- second order model of Cd(II) on SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.723	1.384	1.384		1440	0.0234	1.407	2.563
5	4.737		1.315	821.605	1080			
5	4.732		1.342	536.713	720			
5	4.755		1.224	245.098	300			
5	4.780		1.098	163.934	180			
5	4.845		0.774	77.469	60			
5	4.833		0.833	36.014	30			
5	4.857		0.717	20.921	15			
5	4.879		0.606	16.515	10			
5	4.938		0.311	16.051	5			
5	5.000		0.000		0			



Table C44 Data from pseudo- second order model of Cd(II) on AM-SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.126	4.372	4.372		1440	0.0045	0.269	5.372
5	4.124		4.378	246.688	1080			
5	4.049		4.756	151.404	720			
5	4.128		4.360	68.807	300			
5	4.048		4.758	37.831	180			
5	4.205		3.977	15.089	60			
5	4.038		4.809	6.239	30			
5	4.141		4.297	3.491	15			
5	4.348		3.258	3.069	10			
5	4.450		2.752	1.817	5			
5	5.000		0.000		0			

Table C45 Data from pseudo- second order model of Cd(II) on MP-SCP at pH3

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.234	1.712	1.712		1440	0.0053	0.321	1.125
5	4.192		1.845	585.525	1080			
5	4.203		1.772	406.435	720			
5	4.268		1.362	220.264	300			
5	4.395		1.068	168.618	180			
5	4.449		0.883	67.950	60			
5	4.514		0.644	46.620	30			
5	4.470		0.762	19.698	15			
5	4.440		0.717	13.957	10			
5	4.437		0.561	8.913	5			
5	5.000		0.000		0			

Table C46 Data from pseudo-second order model of Cu(II) on SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.438	2.812	2.812		1440	0.0021	0.125	1.663
5	4.251		3.745	288.423	1080			
5	4.346		3.272	220.083	720			
5	4.358		3.212	93.400	300			
5	4.587		2.068	87.062	180			
5	4.423		2.883	20.812	60			
5	4.471		2.644	11.349	30			
5	4.718		1.412	10.627	15			
5	4.757		1.217	8.220	10			
5	4.858		0.711	7.032	5			
5	5.000		0.000		0			

Table C47 Data from pseudo- second order model of Cu(II) on AM-SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	3.478	7.611	7.611		1440	0.0003	0.020	1.247
5	3.513		7.437	145.220	1080			
5	3.469		7.657	94.038	720			
5	3.700		6.502	46.143	300			
5	3.808		5.959	30.209	180			
5	4.290		3.551	16.897	60			
5	4.573		2.133	14.065	30			
5	4.545		2.278	6.586	15			
5	4.608		1.958	5.107	10			
5	4.692		1.539	3.249	5			
5	5.000		0.000		0			

Table C48 Data from pseudo- second order model of Cu(II) on MP-SCP at pH5

Initial Cu (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	2.514	12.431	12.431		1440	0.0001	0.005	0.669
5	2.645		11.777	91.708	1080			
5	2.866		10.668	67.492	720			
5	3.742		6.290	47.699	300			
5	3.905		5.475	32.877	180			
5	4.183		4.085	14.688	60			
5	4.495		2.524	11.886	30			
5	4.436		2.819	5.322	15			
5	4.359		3.207	3.119	10			
5	4.375		3.124	1.601	5			
5	5.000		0.000		0			

Table C49 Data from pseudo- second order model of Pb(II) on SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.293	3.535	3.535		1440	0.0066	0.399	5.013
5	4.302		3.493	309.234	1080			
5	4.275		3.623	198.747	720			
5	4.391		3.044	98.548	300			
5	4.369		3.157	57.025	180			
5	4.383		3.083	19.462	60			
5	4.445		2.775	10.811	30			
5	4.550		2.253	6.659	15			
5	4.497		2.516	3.975	10			
5	4.655		1.726	2.897	5			
5	5.000		0.000		0			

Table C50 Data from pseudo- second order model of Pb(II) on AM-SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.125	4.377	4.377		1440	0.0034	0.204	4.107
5	4.100		4.503	239.867	1080			
5	4.132		4.342	165.841	720			
5	4.226		3.871	77.509	300			
5	4.183		4.084	44.074	180			
5	4.316		3.421	17.541	60			
5	4.255		3.726	8.052	30			
5	4.310		3.449	4.349	15			
5	4.461		2.695	3.711	10			
5	4.664		1.681	2.975	5			
5	5.000		0.000		0			

Table C51 Data from pseudo- second order model of Pb(II) on MP-SCP at pH5

Initial Pb (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.189	4.056	4.056		1440	0.0008	0.045	0.783
5	4.219		3.904	276.675	1080			
5	4.147		4.266	168.796	720			
5	4.388		3.062	97.975	300			
5	4.532		2.339	76.972	180			
5	4.480		2.601	23.072	60			
5	4.605		1.973	15.205	30			
5	4.807		0.965	15.544	15			
5	4.968		0.161	62.112	10			
5	4.785		1.076	4.649	5			
5	5.000		0.000		0			

Table C52 Data from pseudo- second order model of Cd(II) on SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	q _e (mg/g)	q _t (mg/g)	t/q _t	Time (min)	k ₂ (1/min)	k ₂ (1/hr)	h (mg/g h)
5	4.217	3.915	3.915		1440	0.0038	0.228	2.832
5	4.323		3.384	319.149	1080			
5	4.132		4.342	165.841	720			
5	4.115		4.424	67.812	300			
5	4.220		3.898	46.178	180			
5	4.155		4.225	14.203	60			
5	4.033		4.833	6.207	30			
5	4.207		3.967	3.781	15			
5	4.139		4.306	2.323	10			
5	4.238		3.812	1.312	5			
5	5.000		0.000		0			

Table C53 Data from pseudo- second order model of Cd(II) on AM-SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.426	2.872	2.872		1440	0.0053	0.315	2.613
5	4.424		2.878	375.261	1080			
5	4.449		2.756	261.296	720			
5	4.513		2.436	123.153	300			
5	4.548		2.258	79.717	180			
5	4.605		1.977	30.357	60			
5	4.638		1.809	16.588	30			
5	4.641		1.797	8.350	15			
5	4.684		1.580	6.329	10			
5	4.750		1.252	3.994	5			
5	5.000		0.000		0			

Table C54 Data from pseudo- second order model of Cd(II) on MP-SCP at pH5

Initial Cd (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	4.234	3.833	3.833		1440	0.0029	0.172	2.869
5	4.192		4.042	267.228	1080			
5	4.203		3.984	180.723	720			
5	4.268		3.661	81.956	300			
5	4.395		3.026	59.494	180			
5	4.449		2.757	21.763	60			
5	4.514		2.431	12.341	30			
5	4.470		2.652	5.656	15			
5	4.440		2.798	3.574	10			
5	4.437		2.813	1.777	5			
5	5.000		0.000		0			

Table C55 Data from pseudo- second order model of AB on SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	45.750	14.167	14.167		1440	0.0010	0.058	25.113
5	43.667		21.110	51.161	1080			
5	44.083		19.723	36.505	720			
5	43.333		22.223	13.499	300			
5	44.083		19.723	9.126	180			
5	43.500		21.667	2.769	60			
5	45.083		16.390	1.830	30			
5	44.583		18.057	0.831	15			
5	44.667		17.777	0.563	10			
5	46.083		13.057	0.383	5			
5	50.000		0.000		0			

Table C56 Data from pseudo- second order model of AB on AM-SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	35.583	48.057	48.057		1440	0.0001	0.004	11.708
5	33.250		55.833	19.343	1080			
5	33.500		55.000	13.091	720			
5	33.667		54.443	5.510	300			
5	34.750		50.833	3.541	180			
5	34.167		52.777	1.137	60			
5	35.917		46.943	0.639	30			
5	34.750		50.833	0.295	15			
5	34.083		53.057	0.188	10			
5	36.083		46.390	0.108	5			
5	50.000		0.000		0			

Table C57 Data from pseudo- second order model of AB on MP-SCP at pH5

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	47.917	6.943	6.943		1440	0.0014	0.087	149.684
5	48.167		41.466	26.045	1080			
5	47.667		41.866	17.198	720			
5	48.083		41.534	7.223	300			
5	47.750		41.800	4.306	180			
5	47.333		42.134	1.424	60			
5	48.167		41.466	0.723	30			
5	48.667		41.066	0.365	15			
5	48.750		41.000	0.244	10			
5	48.583		41.134	0.122	5			
5	50.000		40.000	0.000	0			

Table C58 Data from pseudo- second order model of AB on SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	44.333	18.890	18.890		1440	0.0010	0.058	14.022
5	45.083		16.390	65.894	1080			
5	45.667		14.443	49.850	720			
5	46.083		13.057	22.977	300			
5	44.583		18.057	9.969	180			
5	45.750		14.167	4.235	60			
5	44.333		18.890	1.588	30			
5	44.667		17.777	0.844	15			
5	44.417		18.610	0.537	10			
5	44.500		18.333	0.273	5			
5	50.000		0.000		0			

Table C59 Data from pseudo- second order model of AB on AM-SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	36.823	43.923	43.923		1440	0.0005	0.031	56.217
5	37.500		41.667	25.920	1080			
5	36.667		44.443	16.200	720			
5	37.750		40.833	7.347	300			
5	36.750		44.167	4.075	180			
5	37.583		41.390	1.450	60			
5	37.667		41.110	0.730	30			
5	37.750		40.833	0.367	15			
5	38.083		39.723	0.252	10			
5	38.917		36.943	0.135	5			
5	50.000		0.000		0			

Table C60 Data from pseudo- second order model of AB on MP-SCP at pH7

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	45.667	14.443	14.443		1440	0.0013	0.078	138.281
5	46.917		42.466	25.432	1080			
5	48.250		41.400	17.391	720			
5	46.750		42.600	7.042	300			
5	47.667		41.866	4.299	180			
5	46.917		42.466	1.413	60			
5	48.083		41.534	0.722	30			
5	46.333		42.934	0.349	15			
5	47.083		42.334	0.236	10			
5	47.917		41.666	0.120	5			
5	50.000		40.000	0.000	0			

Table C61 Data from pseudo- second order model of AB on SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	48.667	4.443	4.443		1440	0.0038	0.229	2.242
5	49.083		3.057	353.326	1080			
5	48.917		3.610	199.446	720			
5	48.667		4.443	67.517	300			
5	48.583		4.723	38.109	180			
5	48.825		3.917	15.319	60			
5	48.783		4.057	7.395	30			
5	48.750		4.167	3.600	15			
5	49.083		3.057	3.272	10			
5	49.167		2.777	1.801	5			
5	50.000		0.000		0			

Table C62 Data from pseudo- second order model of AB on AM-SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	46.500	11.667	11.667		1440	0.0010	0.062	10.630
5	46.167		12.777	84.529	1080			
5	45.667		14.443	49.850	720			
5	46.750		10.833	27.692	300			
5	46.250		12.500	14.400	180			
5	45.917		13.610	4.409	60			
5	47.083		9.723	3.085	30			
5	46.667		11.110	1.350	15			
5	46.750		10.833	0.923	10			
5	47.458		8.473	0.590	5			
5	50.000		0.000		0			

Table C63 Data from pseudo- second order model of AB on MP-SCP at pH9

Initial AB (mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	47.333	8.890	8.890		1440	0.0642	3.850	66.667
5	48.167		41.466	26.045	1080			
5	47.500		42.000	17.143	720			
5	48.250		41.400	7.246	300			
5	47.917		41.666	4.320	180			
5	48.750		41.000	1.463	60			
5	48.583		41.134	0.729	30			
5	48.083		41.534	0.361	15			
5	48.333		41.334	0.242	10			
5	47.667		41.866	0.119	5			
5	50.000		40.000	0.000	0			

Table C64 Data from pseudo- second order model of MB on SCP at pH5

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	45.357	15.477	15.477		1440	0.0005	0.027	11.336
5	43.857		20.477	52.743	1080			
5	44.000		20.000	36.000	720			
5	44.357		18.810	15.949	300			
5	44.214		19.287	9.333	180			
5	43.500		21.667	2.769	60			
5	44.500		18.333	1.636	30			
5	44.571		18.097	0.829	15			
5	44.643		17.857	0.560	10			
5	46.143		12.857	0.389	5			
5	50.000		0.000		0			

Table C65 Data from pseudo- second order model of MB on AM-SCP at pH5

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	45.857	13.810	13.810		1440	0.0008	0.050	12.492
5	45.357		15.477	69.782	1080			
5	44.875		17.083	42.146	720			
5	45.214		15.953	18.805	300			
5	44.857		17.143	10.500	180			
5	44.929		16.903	3.550	60			
5	45.357		15.477	1.938	30			
5	46.000		13.333	1.125	15			
5	45.500		15.000	0.667	10			
5	46.071		13.097	0.382	5			
5	50.000		0.000		0			

Table C66 Data from pseudo- second order model of MB on MP-SCP at pH5

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	42.857	23.810	23.810		1440	0.0003	0.017	10.821
5	42.214		25.953	41.613	1080			
5	43.143		22.857	31.501	720			
5	43.000		23.333	12.857	300			
5	42.929		23.570	7.637	180			
5	42.143		26.190	2.291	60			
5	42.500		25.000	1.200	30			
5	42.214		25.953	0.578	15			
5	43.571		21.430	0.467	10			
5	43.500		21.667	0.231	5			
5	50.000		0.000		0			

Table C67 Data from pseudo- second order model of MB on SCP at pH7

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	41.214	29.287	29.287		1440	0.0003	0.018	13.974
5	41.357		28.810	37.487	1080			
5	42.143		26.190	27.491	720			
5	41.929		26.903	11.151	300			
5	42.071		26.430	6.810	180			
5	41.357		28.810	2.083	60			
5	41.143		29.523	1.016	30			
5	41.929		26.903	0.558	15			
5	42.071		26.430	0.378	10			
5	42.500		25.000	0.200	5			
5	50.000		0.000		0			

Table C68 Data from pseudo- second order model of MB on AM-SCP at pH7

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	40.135	32.883	32.883		1440	0.0004	0.027	27.332
5	40.214		32.620	33.109	1080			
5	40.929		30.237	23.812	720			
5	40.857		30.477	9.844	300			
5	40.357		32.143	5.600	180			
5	39.857		33.810	1.775	60			
5	40.143		32.857	0.913	30			
5	40.214		32.620	0.460	15			
5	40.500		31.667	0.316	10			
5	41.357		28.810	0.174	5			
5	50.000		0.000		0			

Table C69 Data from pseudo- second order model of MB on MP-SCP at pH7

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	38.143	39.523	39.523		1440	0.0008	0.049	67.249
5	38.857		37.143	29.077	1080			
5	39.071		36.430	19.764	720			
5	38.929		36.903	8.129	300			
5	39.143		36.190	4.974	180			
5	38.500		38.333	1.565	60			
5	38.929		36.903	0.813	30			
5	39.357		35.477	0.423	15			
5	39.214		35.953	0.278	10			
5	39.857		33.810	0.148	5			
5	50.000		0.000	#DIV/0!	0			

Table C70 Data from pseudo- second order model of MB on SCP at pH9

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	35.357	48.810	48.810		1440	0.0001	0.004	8.085
5	37.071		43.097	25.060	1080			
5	36.429		45.237	15.916	720			
5	35.071		49.763	6.029	300			
5	35.929		46.903	3.838	180			
5	36.857		43.810	1.370	60			
5	36.071		46.430	0.646	30			
5	37.143		42.857	0.350	15			
5	36.929		43.570	0.230	10			
5	36.214		45.953	0.109	5			
5	50.000		0.000		0			

Table C71 Data from pseudo- second order model of MB on AM-SCP at pH9

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	46.143	12.857	12.857		1440	0.0021	0.128	19.369
5	46.429		11.903	90.731	1080			
5	45.857		13.810	52.136	720			
5	46.429		11.903	25.203	300			
5	46.357		12.143	14.823	180			
5	45.929		13.570	4.422	60			
5	47.071		9.763	3.073	30			
5	46.143		12.857	1.167	15			
5	46.214		12.620	0.792	10			
5	47.357		8.810	0.568	5			
5	50.000		0.000		0			

Table C72 Data from pseudo- second order model of MB on MP-SCP at pH9

Initial MB(mg/l)	Ce (mg/l)	qe (mg/g)	qt (mg/g)	t/qt	Time (min)	k2 (1/min)	k2 (1/hr)	h (mg/g h)
5	32.929	56.903	56.903		1440	0.0016	0.096	286.533
5	33.357		55.477	19.468	1080			
5	34.071		53.097	13.560	720			
5	33.429		55.237	5.431	300			
5	33.071		56.430	3.190	180			
5	33.857		53.810	1.115	60			
5	33.071		56.430	0.532	30			
5	34.143		52.857	0.284	15			
5	33.929		53.570	0.187	10			
5	33.214		55.953	0.089	5			
5	50.000		0.000		0			

APPENDIX D

Table D1 Data from Langmuir isotherm model of Cu(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4279	0.2021	2.3370	4.9468	2.9044	0.1764
0.8576	0.4108	1.1660	2.4345		
2.7765	0.6447	0.3602	1.5511		
4.4891	1.5175	0.2228	0.6590		
6.3468	1.8663	0.1576	0.5358		
9.1661	2.2951	0.1091	0.4357		

Table D2 Data from Langmuir isotherm model of Cu(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3286	0.5091	3.0432	1.9642	4.5725	0.3765
0.6833	0.8963	1.4635	1.1157		
2.2836	2.0866	0.4379	0.4792		
4.0593	2.7942	0.2463	0.3579		
5.9279	3.1226	0.1687	0.3202		
8.6414	3.9190	0.1157	0.2552		

Table D3 Data from Langmuir isotherm model of Cu(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.0733	1.2550	13.6426	0.7968	21.2314	0.2324
0.4186	1.6150	2.3889	0.6192		
1.5902	3.9900	0.6289	0.2506		
2.5435	7.0861	0.3932	0.1411		
4.1056	8.2697	0.2436	0.1209		
6.9676	9.0972	0.1435	0.1099		

Table D4 Data from Langmuir isotherm model of Pb(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3594	0.4176	2.7824	2.3945	1.8847	0.7104
0.8212	0.5259	1.2177	1.9016		
2.6950	0.8798	0.3711	1.1366		
4.4198	1.6899	0.2263	0.5917		
6.1976	2.3600	0.1614	0.4237		
9.0865	2.6868	0.1101	0.3722		

Table D5 Data from Langmuir isotherm model of Pb(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4308	0.1997	2.3215	5.0067	0.7479	0.7314
0.9242	0.2229	1.0820	4.4855		
2.8738	0.3786	0.3480	2.6413		
4.7882	0.6110	0.2088	1.6368		
6.6774	0.9582	0.1498	1.0436		
9.6344	1.0968	0.1038	0.9117		

Table D6 Data from Langmuir isotherm model of Pb(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3250	0.5147	3.0769	1.9429	2.8588	0.5981
0.7867	0.6212	1.2711	1.6097		
2.5348	1.3818	0.3945	0.7237		
4.0808	2.6773	0.2450	0.3735		
5.8267	3.4509	0.1716	0.2898		
8.6246	4.0853	0.1159	0.2448		

Table D7 Data from Langmuir isotherm model of Cd(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4581	0.1232	2.1828	8.1184	7.3206	0.0372
0.9167	0.2380	1.0909	4.2017		
2.7858	0.6179	0.3590	1.6184		
4.5640	1.2952	0.2191	0.7721		
6.4640	1.5613	0.1547	0.6405		
9.3934	1.7331	0.1065	0.5770		

Table D8 Data from Langmuir isotherm model of Cd(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4754	0.0717	2.1035	13.9566	1.2809	0.1250
0.8873	0.3381	1.1270	2.9580		
2.8285	0.5094	0.3535	1.9631		
4.6219	1.1121	0.2164	0.8992		
6.3462	1.9043	0.1576	0.5251		
9.2092	2.3724	0.1086	0.4215		

Table D9 Data from Langmuir isotherm model of Cd(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3536	0.4349	2.8281	2.2996	2.9214	0.4818
0.7536	0.7394	1.3271	1.3525		
2.5945	1.1697	0.3854	0.8549		
4.3354	1.9938	0.2307	0.5016		
6.0045	2.9279	0.1665	0.3415		
8.8224	3.4299	0.1133	0.2916		

Table D10 Data from Langmuir isotherm model of Cu(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4279	0.2021	2.3370	4.9468	2.9044	0.1764
0.8576	0.4108	1.1660	2.4345		
2.7765	0.6447	0.3602	1.5511		
4.4891	1.5175	0.2228	0.6590		
6.3468	1.8663	0.1576	0.5358		
9.1661	2.2951	0.1091	0.4357		

Table D11 Data from Langmuir isotherm model of Cu(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3286	0.5091	3.0432	1.9642	4.5725	0.3765
0.6833	0.8963	1.4635	1.1157		
2.2836	2.0866	0.4379	0.4792		
4.0593	2.7942	0.2463	0.3579		
5.9279	3.1226	0.1687	0.3202		
8.6414	3.9190	0.1157	0.2552		

Table D12 Data from Langmuir isotherm model of Cu(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.0733	1.2550	13.6426	0.7968	21.2314	0.2324
0.4186	1.6150	2.3889	0.6192		
1.5902	3.9900	0.6289	0.2506		
2.5435	7.0861	0.3932	0.1411		
4.1056	8.2697	0.2436	0.1209		
6.9676	9.0972	0.1435	0.1099		

Table D13 Data from Langmuir isotherm model of Pb(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3594	0.4176	2.7824	2.3945	1.8847	0.7104
0.8212	0.5259	1.2177	1.9016		
2.6950	0.8798	0.3711	1.1366		
4.4198	1.6899	0.2263	0.5917		
6.1976	2.3600	0.1614	0.4237		
9.0865	2.6868	0.1101	0.3722		

Table D14 Data from Langmuir isotherm model of Pb(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4308	0.1997	2.3215	5.0067	0.7479	0.7314
0.9242	0.2229	1.0820	4.4855		
2.8738	0.3786	0.3480	2.6413		
4.7882	0.6110	0.2088	1.6368		
6.6774	0.9582	0.1498	1.0436		
9.6344	1.0968	0.1038	0.9117		

Table D15 Data from Langmuir isotherm model of Pb(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3250	0.5147	3.0769	1.9429	2.8588	0.5981
0.7867	0.6212	1.2711	1.6097		
2.5348	1.3818	0.3945	0.7237		
4.0808	2.6773	0.2450	0.3735		
5.8267	3.4509	0.1716	0.2898		
8.6246	4.0853	0.1159	0.2448		

Table D16 Data from Langmuir isotherm model of Cd(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4581	0.1232	2.1828	8.1184	7.3206	0.0372
0.9167	0.2380	1.0909	4.2017		
2.7858	0.6179	0.3590	1.6184		
4.5640	1.2952	0.2191	0.7721		
6.4640	1.5613	0.1547	0.6405		
9.3934	1.7331	0.1065	0.5770		

Table D17 Data from Langmuir isotherm model of Cd(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4754	0.0717	2.1035	13.9566	1.2809	0.1250
0.8873	0.3381	1.1270	2.9580		
2.8285	0.5094	0.3535	1.9631		
4.6219	1.1121	0.2164	0.8992		
6.3462	1.9043	0.1576	0.5251		
9.2092	2.3724	0.1086	0.4215		

Table D18 Data from Langmuir isotherm model of Cd(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.3536	0.4349	2.8281	2.2996	2.9214	0.4818
0.7536	0.7394	1.3271	1.3525		
2.5945	1.1697	0.3854	0.8549		
4.3354	1.9938	0.2307	0.5016		
6.0045	2.9279	0.1665	0.3415		
8.8224	3.4299	0.1133	0.2916		

Table D19 Data from Langmuir isotherm model of AB on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4581	0.1232	2.1828	8.1184	7.3206	0.0372
0.9167	0.2380	1.0909	4.2017		
2.7858	0.6179	0.3590	1.6184		
4.5640	1.2952	0.2191	0.7721		
6.4640	1.5613	0.1547	0.6405		
9.3934	1.7331	0.1065	0.5770		

Table D20 Data from Langmuir isotherm model of AB on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
2.2500	6.6748	0.4444	0.1498	22.2717	0.1930
5.2500	11.7574	0.1905	0.0851		
23.0000	17.5000	0.0435	0.0571		
41.9167	19.8121	0.0239	0.0505		
61.7500	20.0243	0.0162	0.0499		
91.4167	21.4583	0.0109	0.0466		

Table D21 Data from Langmuir isotherm model of AB on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
3.9167	2.6294	0.2553	0.3803	17.6056	0.0500
7.2500	6.8069	0.1379	0.1469		
26.0833	9.7917	0.0383	0.1021		
45.5000	10.7143	0.0220	0.0933		
65.0000	12.2549	0.0154	0.0816		
95.0000	12.3762	0.0105	0.0808		

Table D22 Data from Langmuir isotherm model of AB on SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4581	0.1232	2.1828	8.1184	7.3206	0.0372
0.9167	0.2380	1.0909	4.2017		
2.7858	0.6179	0.3590	1.6184		
4.5640	1.2952	0.2191	0.7721		
6.4640	1.5613	0.1547	0.6405		
9.3934	1.7331	0.1065	0.5770		

Table D23 Data from Langmuir isotherm model of AB on AM-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
2.2500	6.6748	0.4444	0.1498	22.2717	0.1930
5.2500	11.7574	0.1905	0.0851		
23.0000	17.5000	0.0435	0.0571		
41.9167	19.8121	0.0239	0.0505		
61.7500	20.0243	0.0162	0.0499		
91.4167	21.4583	0.0109	0.0466		

Table D24 Data from Langmuir isotherm model of AB on MP-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
3.9167	2.6294	0.2553	0.3803	17.6056	0.0500
7.2500	6.8069	0.1379	0.1469		
26.0833	9.7917	0.0383	0.1021		
45.5000	10.7143	0.0220	0.0933		
65.0000	12.2549	0.0154	0.0816		
95.0000	12.3762	0.0105	0.0808		

Table D25 Data from Langmuir isotherm model of AB on SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.4581	0.1232	2.1828	8.1184	7.3206	0.0372
0.9167	0.2380	1.0909	4.2017		
2.7858	0.6179	0.3590	1.6184		
4.5640	1.2952	0.2191	0.7721		
6.4640	1.5613	0.1547	0.6405		
9.3934	1.7331	0.1065	0.5770		

Table D26 Data from Langmuir isotherm model of AB on AM-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
2.2500	6.6748	0.4444	0.1498	22.2717	0.1930
5.2500	11.7574	0.1905	0.0851		
23.0000	17.5000	0.0435	0.0571		
41.9167	19.8121	0.0239	0.0505		
61.7500	20.0243	0.0162	0.0499		
91.4167	21.4583	0.0109	0.0466		

Table D27 Data from Langmuir isotherm model of AB on MP-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
3.9167	2.6294	0.2553	0.3803	17.6056	0.0500
7.2500	6.8069	0.1379	0.1469		
26.0833	9.7917	0.0383	0.1021		
45.5000	10.7143	0.0220	0.0933		
65.0000	12.2549	0.0154	0.0816		
95.0000	12.3762	0.0105	0.0808		

Table D28 Data from Langmuir isotherm model of MB on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.2143	11.8458	4.6667	0.0844	32.6797	2.5714
3.0000	17.3267	0.3333	0.0577		
18.0000	28.3019	0.0556	0.0353		
36.7857	32.0735	0.0272	0.0312		
51.4286	45.5182	0.0194	0.0220		
70.5714	72.8430	0.0142	0.0137		

Table D29 Data from Langmuir isotherm model of MB on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
1.2143	9.4643	0.8235	0.1057	17.6056	0.8516
5.7143	10.6082	0.1750	0.0943		
24.9286	12.1909	0.0401	0.0820		
44.3571	13.8305	0.0225	0.0723		
59.6429	25.3852	0.0168	0.0394		
78.8571	50.8242	0.0127	0.0197		

Table D30 Data from Langmuir isotherm model of MB on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.0714	12.3214	14.0000	0.0812	39.5257	6.1707
1.5714	20.4577	0.6364	0.0489		
16.2143	33.7885	0.0617	0.0296		
32.8571	42.8571	0.0304	0.0233		
46.6429	57.2479	0.0214	0.0175		
63.5714	89.2857	0.0157	0.0112		

Table D31 Data from Langmuir isotherm model of MB on SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.2143	11.8458	4.6667	0.0844	32.6797	2.5714
3.0000	17.3267	0.3333	0.0577		
18.0000	28.3019	0.0556	0.0353		
36.7857	32.0735	0.0272	0.0312		
51.4286	45.5182	0.0194	0.0220		
70.5714	72.8430	0.0142	0.0137		

Table D32 Data from Langmuir isotherm model of MB on AM-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
1.2143	9.4643	0.8235	0.1057	17.6056	0.8516
5.7143	10.6082	0.1750	0.0943		
24.9286	12.1909	0.0401	0.0820		
44.3571	13.8305	0.0225	0.0723		
59.6429	25.3852	0.0168	0.0394		
78.8571	50.8242	0.0127	0.0197		

Table D33 Data from Langmuir isotherm model of MB on MP-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.0714	12.3214	14.0000	0.0812	39.5257	6.1707
1.5714	20.4577	0.6364	0.0489		
16.2143	33.7885	0.0617	0.0296		
32.8571	42.8571	0.0304	0.0233		
46.6429	57.2479	0.0214	0.0175		
63.5714	89.2857	0.0157	0.0112		

Table D34 Data from Langmuir isotherm model of MB on SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.2143	11.8458	4.6667	0.0844	32.6797	2.5714
3.0000	17.3267	0.3333	0.0577		
18.0000	28.3019	0.0556	0.0353		
36.7857	32.0735	0.0272	0.0312		
51.4286	45.5182	0.0194	0.0220		
70.5714	72.8430	0.0142	0.0137		

Table D35 Data from Langmuir isotherm model of MB on AM-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
1.2143	9.4643	0.8235	0.1057	17.6056	0.8516
5.7143	10.6082	0.1750	0.0943		
24.9286	12.1909	0.0401	0.0820		
44.3571	13.8305	0.0225	0.0723		
59.6429	25.3852	0.0168	0.0394		
78.8571	50.8242	0.0127	0.0197		

Table D36 Data from Langmuir isotherm model of MB on MP-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	1/Ce	1/qe	qm	b
0.0714	12.3214	14.0000	0.0812	39.5257	6.1707
1.5714	20.4577	0.6364	0.0489		
16.2143	33.7885	0.0617	0.0296		
32.8571	42.8571	0.0304	0.0233		
46.6429	57.2479	0.0214	0.0175		
63.5714	89.2857	0.0157	0.0112		

Table D37 Data from Freundlich isotherm model of Cu(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4279	0.2021	-0.3687	-0.6943	0.9294	1.2694
0.8576	0.4108	-0.0667	-0.3864		
2.7765	0.6447	0.4435	-0.1906		
4.4891	1.5175	0.6522	0.1811		
6.3468	1.8663	0.8026	0.2710		
9.1661	2.2951	0.9622	0.3608		

Table D38 Data from Freundlich isotherm model of Cu(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3286	0.5091	-0.4833	-0.2932	3.1653	1.6098
0.6833	0.8963	-0.1654	-0.0475		
2.2836	2.0866	0.3586	0.3194		
4.0593	2.7942	0.6085	0.4463		
5.9279	3.1226	0.7729	0.4945		
8.6414	3.9190	0.9366	0.5932		

Table D39 Data from Freundlich isotherm model of Cu(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.0733	1.2550	-1.1349	0.0986	0.5786	2.0354
0.4186	1.6150	-0.3782	0.2082		
1.5902	3.9900	0.2015	0.6010		
2.5435	7.0861	0.4054	0.8504		
4.1056	8.2697	0.6134	0.9175		
6.9676	9.0972	0.8431	0.9589		

Table D40 Data from Freundlich isotherm model of Pb(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4308	0.1997	-0.3658	-0.6996	0.5551	1.7227
0.9242	0.2229	-0.0342	-0.6518		
2.8738	0.3786	0.4585	-0.4218		
4.7882	0.6110	0.6802	-0.2140		
6.6774	0.9582	0.8246	-0.0185		
9.6344	1.0968	0.9838	0.0401		

Table D41 Data from Freundlich isotherm model of Pb(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3594	0.4176	-0.4444	-0.3792	1.7071	1.6351
0.8212	0.5259	-0.0856	-0.2791		
2.6950	0.8798	0.4306	-0.0556		
4.4198	1.6899	0.6454	0.2279		
6.1976	2.3600	0.7922	0.3729		
9.0865	2.6868	0.9584	0.4292		

Table D42 Data from Freundlich isotherm model of Pb(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3250	0.5147	-0.4881	-0.2884	3.2065	1.4497
0.7867	0.6212	-0.1042	-0.2067		
2.5348	1.3818	0.4039	0.1404		
4.0808	2.6773	0.6107	0.4277		
5.8267	3.4509	0.7654	0.5379		
8.6246	4.0853	0.9357	0.6112		

Table D43 Data from Freundlich isotherm model of Cd(II) on SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4581	0.1232	-0.3390	-0.9095	0.5339	1.0819
0.9167	0.2380	-0.0378	-0.6234		
2.7858	0.6179	0.4449	-0.2091		
4.5640	1.2952	0.6593	0.1123		
6.4640	1.5613	0.8105	0.1935		
9.3934	1.7331	0.9728	0.2388		

Table D44 Data from Freundlich isotherm model of Cd(II) on AM-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4754	0.0717	-0.3229	-1.1448	0.4250	0.9237
0.8873	0.3381	-0.0519	-0.4710		
2.8285	0.5094	0.4516	-0.2929		
4.6219	1.1121	0.6648	0.0461		
6.3462	1.9043	0.8025	0.2797		
9.2092	2.3724	0.9642	0.3752		

Table D45 Data from Freundlich isotherm model of Cd(II) on MP-SCP at pH3

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3536	0.4349	-0.4515	-0.3617	2.4430	1.5738
0.7536	0.7394	-0.1229	-0.1311		
2.5945	1.1697	0.4141	0.0681		
4.3354	1.9938	0.6370	0.2997		
6.0045	2.9279	0.7785	0.4666		
8.8224	3.4299	0.9456	0.5353		

Table D46 Data from Freundlich isotherm model of Cu(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4030	0.4800	-0.3947	-0.3188	2.3518	1.2736
0.8852	0.5629	-0.0530	-0.2495		
2.6557	1.6555	0.4242	0.2189		
4.4391	2.7769	0.6473	0.4436		
6.3267	3.3007	0.8012	0.5186		
8.9781	4.8205	0.9532	0.6831		

Table D47 Data from Freundlich isotherm model of Cu(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.1144	1.5426	-0.9417	0.1882	0.6553	1.9685
0.5834	1.6663	-0.2340	0.2218		
2.2414	3.0651	0.3505	0.4864		
3.3723	6.5107	0.5279	0.8136		
4.5463	9.9141	0.6577	0.9963		
7.3127	10.7493	0.8641	1.0314		

Table D48 Data from Freundlich isotherm model of Cu(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.0642	1.6926	-1.1928	0.2286	0.3528	1.9940
0.4653	2.0178	-0.3323	0.3049		
1.6498	5.2949	0.2174	0.7239		
2.3539	10.2761	0.3718	1.0118		
3.9625	11.6827	0.5980	1.0675		
6.5995	13.2058	0.8195	1.1208		

Table D49 Data from Freundlich isotherm model of Pb(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4008	0.4771	-0.3971	-0.3214	2.4316	1.4691
0.8531	0.7201	-0.0690	-0.1426		
2.7485	1.2575	0.4391	0.0995		
4.5022	2.3933	0.6534	0.3790		
6.3361	3.2866	0.8018	0.5168		
9.2544	3.7280	0.9663	0.5715		

Table D50 Data from Freundlich isotherm model of Pb(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3702	0.5141	-0.4316	-0.2890	2.7504	1.4966
0.7127	1.1267	-0.1471	0.0518		
2.4950	1.9423	0.3971	0.2883		
4.1490	3.3049	0.6179	0.5192		
5.9818	3.9929	0.7768	0.6013		
8.8478	4.5184	0.9468	0.6550		

Table D51 Data from Freundlich isotherm model of Pb(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3294	0.6690	-0.4823	-0.1746	2.0047	1.6545
0.6963	1.1793	-0.1572	0.0716		
2.4558	2.1552	0.3902	0.3335		
4.1500	3.3010	0.6180	0.5186		
5.8838	4.3773	0.7697	0.6412		
8.8006	4.7501	0.9445	0.6767		

Table D52 Data from Freundlich isotherm model of Cd(II) on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4350	0.2549	-0.3615	-0.5936	1.5292	1.1480
0.8273	0.6579	-0.0823	-0.1819		
2.6885	1.1981	0.4295	0.0785		
4.4219	2.2895	0.6456	0.3597		
6.1462	3.3157	0.7886	0.5206		
8.9920	3.8400	0.9539	0.5843		

Table D53 Data from Freundlich isotherm model of Cd(II) on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.4061	0.4560	-0.3914	-0.3410	4.2064	1.2282
0.8257	0.8715	-0.0832	-0.0597		
2.6028	1.9665	0.4154	0.2937		
4.3762	3.0580	0.6411	0.4854		
6.0294	4.7118	0.7803	0.6732		
8.8980	5.5102	0.9493	0.7412		

Table D54 Data from Freundlich isotherm model of Cd(II) on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.2536	0.9758	-0.5959	-0.0106	1.3295	1.8175
0.6595	1.3620	-0.1808	0.1342		
2.3914	2.3408	0.3787	0.3694		
4.0394	3.8424	0.6063	0.5846		
5.5445	5.7078	0.7439	0.7565		
8.4251	6.1161	0.9256	0.7865		

Table D55 Data from Freundlich isotherm model of AB on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
2.2500	6.6748	0.3522	0.8244	0.2356	3.3557
5.2500	11.7574	0.7202	1.0703		
23.0000	17.5000	1.3617	1.2430		
41.9167	19.8121	1.6224	1.2969		
61.7500	20.0243	1.7906	1.3016		
91.4167	21.4583	1.9610	1.3316		

Table D56 Data from Freundlich isotherm model of AB on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.0833	14.6040	-1.0792	1.1645	0.3067	5.3022
2.0833	23.7500	0.3188	1.3757		
15.5833	43.2500	1.1927	1.6360		
34.6667	46.0000	1.5399	1.6628		
53.2500	47.8571	1.7263	1.6799		
83.3333	49.5050	1.9208	1.6946		

Table D57 Data from Freundlich isotherm model of AB on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
3.0833	4.6521	0.4890	0.6676	0.5829	3.4722
7.2500	6.8069	0.8603	0.8330		
26.0833	9.7917	1.4164	0.9909		
45.5000	11.0294	1.6580	1.0426		
65.0000	12.1359	1.8129	1.0841		
95.0000	12.5000	1.9777	1.0969		

Table D58 Data from Freundlich isotherm model of AB on SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
2.4167	6.1508	0.3832	0.7889	0.4099	3.0497
6.5833	8.2131	0.8184	0.9145		
24.1667	14.2974	1.3832	1.1553		
43.4167	15.6746	1.6377	1.1952		
62.7500	18.1250	1.7976	1.2583		
91.9167	19.4311	1.9634	1.2885		

Table D59 Data from Freundlich isotherm model of AB on AM-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.1667	14.2157	-0.7782	1.1528	0.2536	4.8852
3.0833	20.7500	0.4890	1.3170		
17.0833	37.9902	1.2326	1.5797		
35.2500	42.9612	1.5472	1.6331		
54.9167	45.2500	1.7397	1.6556		
84.2500	45.0000	1.9256	1.6532		

Table D60 Data from Freundlich isotherm model of AB on MP-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
3.2500	4.2892	0.5119	0.6324	0.6888	3.6969
7.7500	5.4612	0.8893	0.7373		
26.5833	8.2929	1.4246	0.9187		
46.1667	9.3954	1.6643	0.9729		
66.1667	9.1270	1.8206	0.9603		
95.6667	10.8333	1.9808	1.0348		

Table D61 Data from Freundlich isotherm model of AB on SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
3.5000	3.7129	0.5441	0.5697	0.8430	3.7425
8.0833	4.7917	0.9076	0.6805		
27.3333	6.2893	1.4367	0.7986		
46.8333	7.9167	1.6706	0.8985		
66.5833	8.5417	1.8234	0.9315		
96.2500	8.6806	1.9834	0.9385		

Table D62 Data from Freundlich isotherm model of AB on AM-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
2.1667	8.0952	0.3358	0.9082	0.1292	4.4803
5.8333	12.5000	0.7659	1.0969		
24.5000	16.5000	1.3892	1.2175		
44.0000	17.8218	1.6435	1.2510		
63.5833	18.8725	1.8033	1.2758		
93.3333	19.4175	1.9700	1.2882		

Table D63 Data from Freundlich isotherm model of AB on MP-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
3.2500	4.2067	0.5119	0.6239	0.6864	3.3580
7.4167	6.1508	0.8702	0.7889		
26.4167	8.8696	1.4219	0.9479		
45.6667	10.0309	1.6596	1.0013		
65.3333	10.9034	1.8151	1.0376		
95.2500	11.7574	1.9789	1.0703		

Table D64 Data from Freundlich isotherm model of MB on SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.5000	10.7143	-0.3010	1.0300	0.0005	5.1653
5.4286	11.0957	0.7347	1.0452		
24.1429	14.0797	1.3828	1.1486		
42.7143	18.0339	1.6306	1.2561		
60.0714	24.0985	1.7787	1.3820		
86.5000	33.7500	1.9370	1.5283		

Table D65 Data from Freundlich isotherm model of MB on AM-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
1.5000	8.7500	0.1761	0.9420	0.2080	4.1237
6.2857	9.1036	0.7984	0.9592		
25.7143	10.4022	1.4102	1.0171		
44.4286	13.1402	1.6477	1.1186		
62.7857	17.6821	1.7979	1.2475		
87.5000	29.7619	1.9420	1.4737		

Table D66 Data from Freundlich isotherm model of MB on MP-SCP at pH5

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.2143	11.7297	-0.6690	1.0693	0.0948	5.6948
4.7857	12.9066	0.6799	1.1108		
23.6429	15.4300	1.3737	1.1884		
41.2143	21.7468	1.6150	1.3374		
58.7143	27.6611	1.7687	1.4419		
83.2143	41.9643	1.9202	1.6229		

Table D67 Data from Freundlich isotherm model of MB on SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.3571	10.9501	-0.4472	1.0394	0.0957	3.6778
3.7143	15.5587	0.5699	1.1920		
20.0714	24.0985	1.3026	1.3820		
37.7143	30.1120	1.5765	1.4787		
54.5000	37.2596	1.7364	1.5712		
76.9286	54.9320	1.8861	1.7398		

Table D68 Data from Freundlich isotherm model of MB on AM-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
1.8571	7.8571	0.2688	0.8953	0.2586	2.2738
4.8571	12.7298	0.6864	1.1048		
21.5000	21.0396	1.3324	1.3230		
40.0000	24.5098	1.6021	1.3893		
55.9286	35.1786	1.7476	1.5463		
80.3571	49.1071	1.9050	1.6911		

Table D69 Data from Freundlich isotherm model of MB on MP-SCP at pH7

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.0714	12.3214	-1.1461	1.0907	0.2348	4.7755
2.5000	18.3824	0.3979	1.2644		
19.1429	25.8503	1.2820	1.4125		
34.7857	36.5728	1.5414	1.5632		
51.7857	44.2094	1.7142	1.6455		
74.6429	62.7652	1.8730	1.7977		

Table D70 Data from Freundlich isotherm model of MB on SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.2143	11.8458	-0.6690	1.0736	0.1698	3.6832
3.0000	17.3267	0.4771	1.2387		
18.0000	28.3019	1.2553	1.4518		
36.7857	32.0735	1.5657	1.5061		
51.4286	45.5182	1.7112	1.6582		
70.5714	72.8430	1.8486	1.8624		

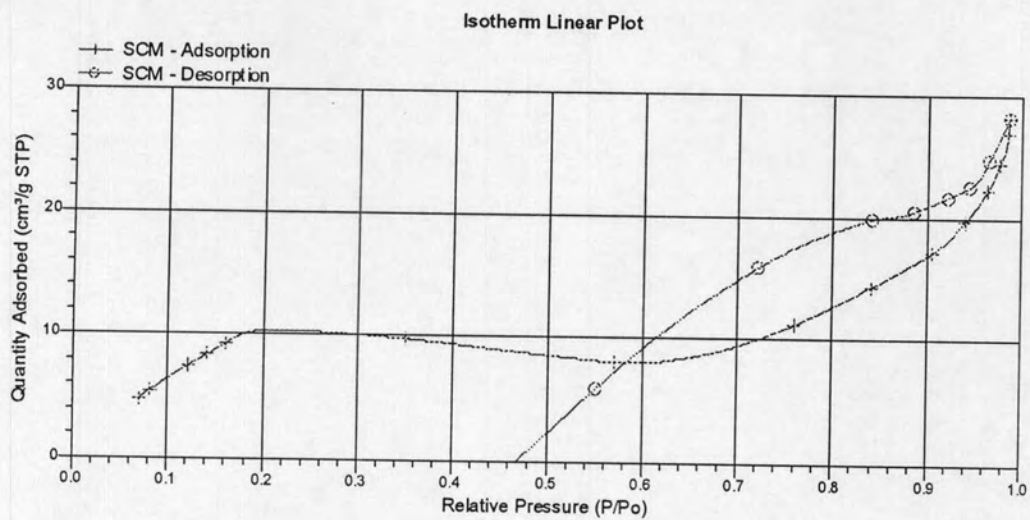
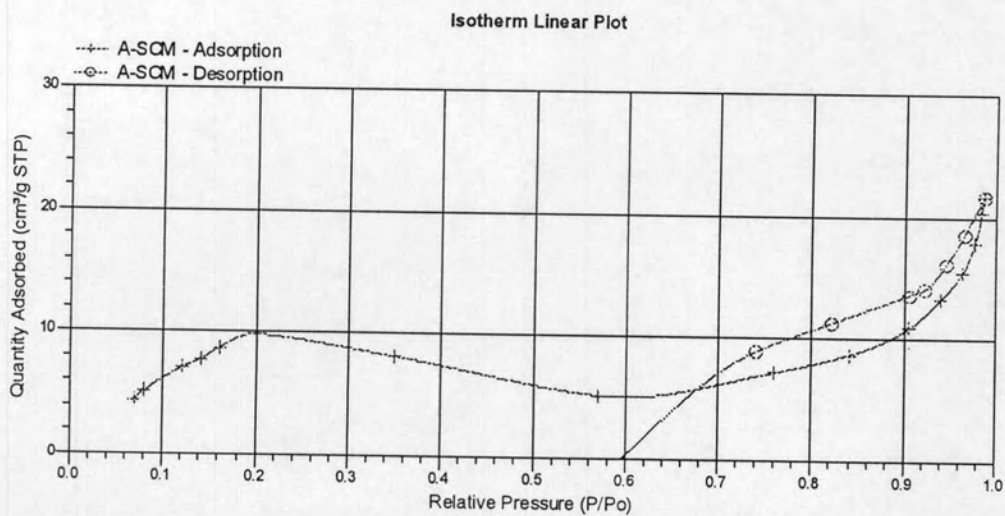
Table D71 Data from Freundlich isotherm model of MB on AM-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
1.2143	9.4643	0.0843	0.9761	0.1666	3.3434
5.7143	10.6082	0.7570	1.0256		
24.9286	12.1909	1.3967	1.0860		
44.3571	13.8305	1.6470	1.1408		
59.6429	25.3852	1.7756	1.4046		
78.8571	50.8242	1.8968	1.7061		

Table D72 Data from Freundlich isotherm model of MB on MP-SCP at pH9

Ce (mg/l)	Adsorption Capacity (mg/g)	log Ce	log qe	Kf	n
0.0714	12.3214	-1.1461	1.0907	0.2792	3.9216
1.5714	20.4577	0.1963	1.3109		
16.2143	33.7885	1.2099	1.5288		
32.8571	42.8571	1.5166	1.6320		
46.6429	57.2479	1.6688	1.7578		
63.5714	89.2857	1.8033	1.9508		

APPENDIX E

Figure E1 Isotherm linear plot N₂ adsorption of SCPFigure E2 Isotherm linear plot N₂ adsorption of AM-SCP

BIOGRAPHY

Mr. Sumeth Junsuthonpoj was born on September 5, 1984 in Nakhonpathom province. After he graduated high school in Pharpathomwitayalai, Nakhonpathom, He went to study in Faculty of environmental and resources studies at Mahidol University. He graduated Bachelor's degree of science of environmental resource studies in 2006. After that he continued his study for a Master's degree of science in Environmental management (International program) at Chulalongkorn University in May 2006.

