

Supplementary

Biochars from Lignin-rich Residue of Furfural Manufacturing Process for Heavy Metal Ions Remediation

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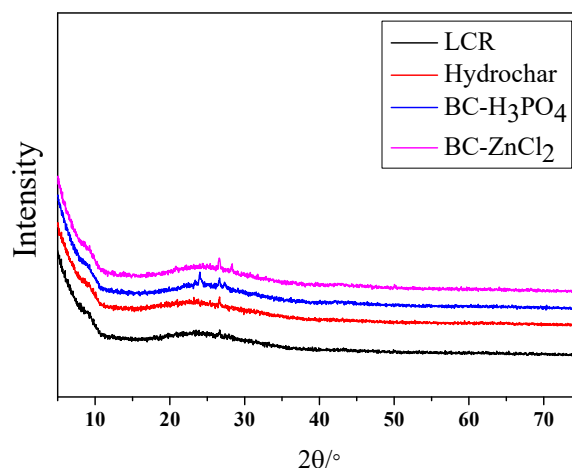


Figure S1. XRD of Hydrochar, BC- H_3PO_4 and BC- ZnCl_2 .

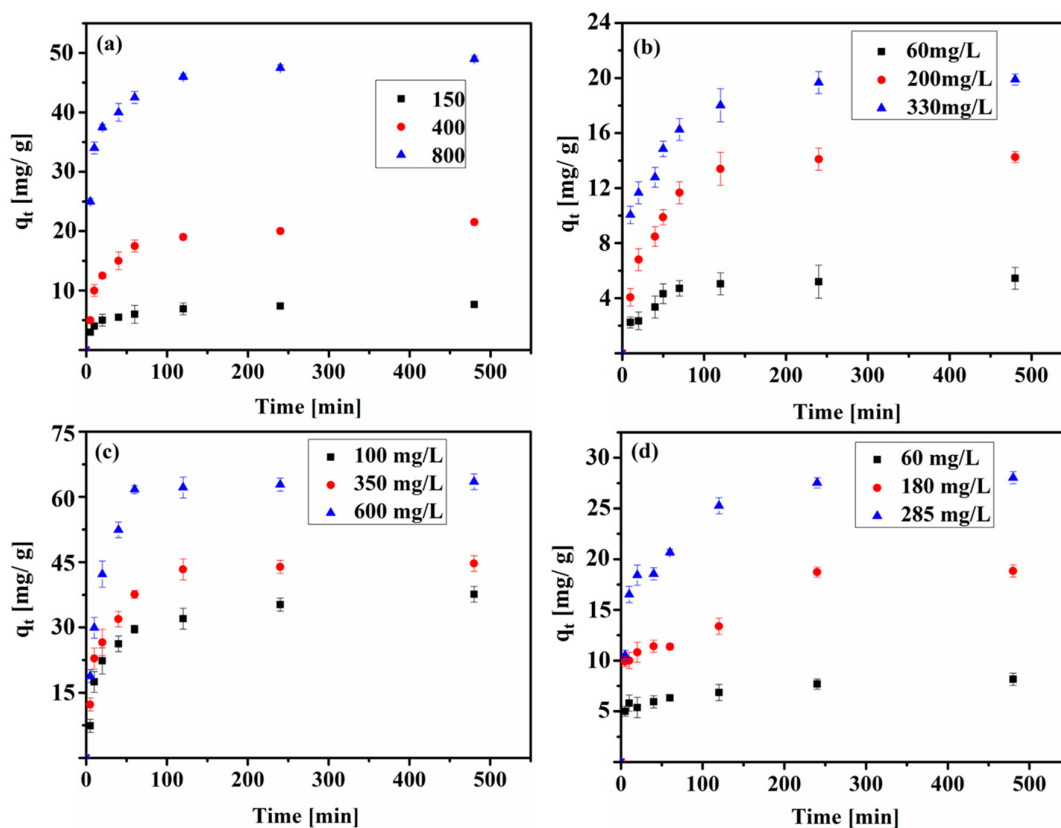


Figure S2. Kinetics analyses of the adsorption of Cd (II) on (a) BC-H₃PO₄, (c) BC-ZnCl₂ and the adsorption of Cu (II) on (b) BC-H₃PO₄, (d) BC-ZnCl₂ as a function of contact time.

Table S1. Kinetic fitting parameters of PFO, PSO and IPD model for BC-H₃PO₄ removal of Cd (II) and Cu (II).

C _o	q _{exp}	PFO			PSO			IPD		
		Q ₁	K ₁	R ²	Q ₂	K ₂	R ²	K _i	C	R ²
Cd (II)										
150 mg/L	5.3	7.5	0.032	0.645	5.0	0.0060	0.998	0.586	5.388	0.671
400 mg/L	20.1	24.3	0.50	0.768	19.6	0.0016	0.998	1.776	12.508	0.698
800 mg/L	48.2	37.9	0.047	0.636	47.8	0.0016	1.000	3.267	45.200	0.496
Cu (II)										
60 mg/L	4.8	3.7	0.03	0.550	4.8	0.136	0.999	0.266	2.401	0.635
200 mg/L	13.8	10.3	0.047	0.659	13.2	0.0185	0.999	0.745	5.492	0.695
330 mg/L	20.6	18.6	0.055	0.740	20.4	0.0733	0.999	0.903	9.856	0.624

Table 2. Kinetic fitting parameters of PFO, PSO and IPD model for BC-ZnCl₂ removal of Cd (II) and Cu (II).

C _o	q _{exp}	PFO			PSO			IPD		
		Q ₁	K ₁	R ²	Q ₂	K ₂	R ²	K _i	C	R ²
Cd (II)										
100 mg/L	33.1	36.9	0.086	0.940	32.9	0.005	0.998	5.22	5.001	0.707
350 mg/L	40.9	43.9	0.097	0.821	41.3	0.006	0.999	6.19	7.762	0.666
600 mg/L	62.1	69.2	0.113	0.745	62.7	0.006	0.999	8.61	6.567	0.570
Cu (II)										
60 mg/L	7.2	6.2	0.068	0.903	7.6	0.012	0.997	2.593	5.985	0.533
180 mg/L	18.4	15.4	0.103	0.879	18.9	0.032	0.985	6.919	6.527	0.730
285 mg/L	28.1	26.5	0.098	0.926	28.7	0.039	0.998	7.736	7.67	0.678



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