Electronic Supplementary Material (ESI) for RSC Advances.
This journal is © The Royal Society of Chemistry 2015

Table and Figure Captions

Tables

Table 1 pH, Ash contents, elemental compositions, atomic ratios, and SSA of the CBR and CBR-biochars produced at different pyrolysis temperatures.

Table 2 Parameters of Freundlich and Langmuir models for Cr(VI) removal.

Table 1

pH, ash, elemental composition, atomic ratio, surface area

Sample	pH	pH_{PZC}	Ash(%)	C (%)	H (%)	N (%)	O (%)	H/C	O/C	(O+N)/C	SSA(m^2/g)
CBR	4.02	3.89	6.12	44.12	5.65	4.24	45.99	1.537	0.782	0.864	0.447
CBR300	6.08	5.85	14.18	56.53	3.86	5.07	42.26	0.819	0.561	0.638	0.986
CBR400	6.89	6.63	20.07	65.68	3.70	5.11	25.51	0.676	0.292	0.358	1.420
CBR500	7.03	6.82	20.11	71.95	3.08	4.69	20.28	0.514	0.211	0.267	7.155
CBR600	8.92	8.74	21.43	73.36	2.78	4.47	19.39	0.455	0.198	0.250	58.232

Table 2

Samples	Freundlich			Langmuir		
	K_F	n	R^2	q_e	b	R^2
CBR	3.89	1.43	0.99	40.99	4.32	0.546
CBR300	2.53	1.43	0.97	37.35	3.35	0.501
CBR400	1.70	1.19	0.99	39.75	4.04	0.504
CBR500	2.34	1.23	0.99	41.43	3.49	0.503
CBR600	4.52	1.45	0.98	42.83	3.58	0.506

Figures

Fig.1. Functional groups present on CBR and CBR-chars inferred from FT-IR (cm^{-1}).

Fig.2. Effects of initial pH on Cr(VI) removal efficiency of CBR and CBR-derived chars at initial Cr(VI) concentration of 50 mg L^{-1}.

Fig.3 Effects of time on Cr concentration at initial pH of 2, and Cr(VI) concentration of 50 mg L^{-1}

Fig.4. Effects of initial Cr(VI) concentration on Cr(VI) removals by CBR and CBR-derived chars at pH 2.

Fig.5. Effects of addition amounts of CBR or CBR-chars on Cr(VI) removal efficiency at initial pH 2 and Cr(VI) concentration 50 mg L^{-1}.

Fig.6. Functional groups present on CBR and CBR-chars inferred from FT-IR (cm^{-1}) after Cr adsorption under the conditions of initial pH of 2, Cr(VI) concentration of 50 mg L^{-1}, and adsorbent dosage of 5 g L^{-1}.

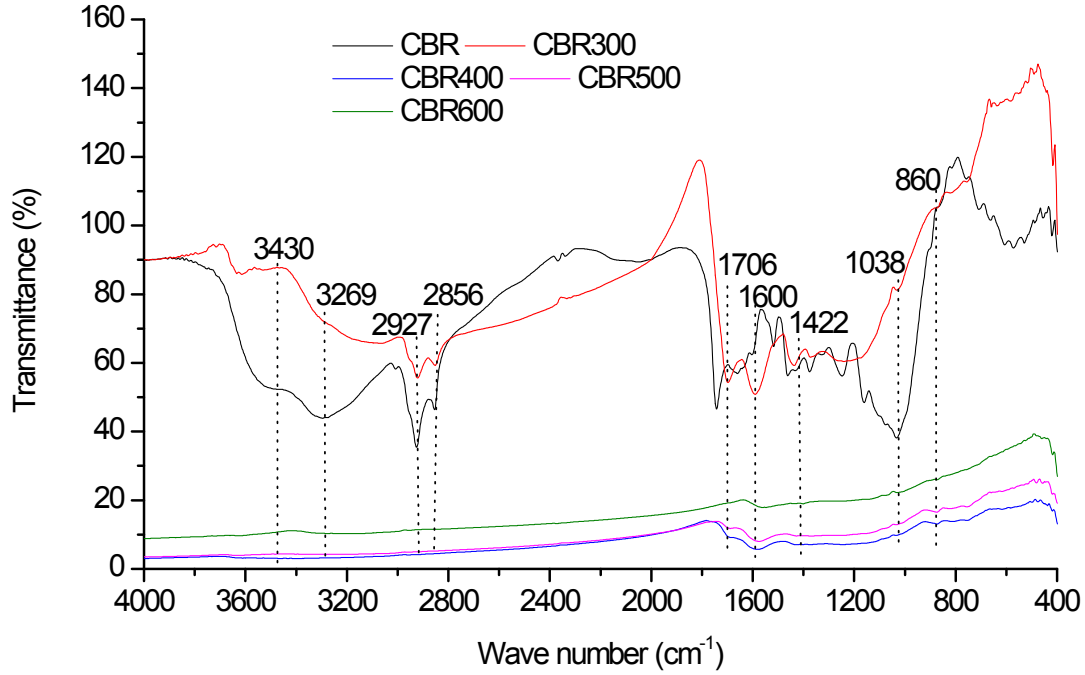
CBR
CBR300
CBR400
CBR500
CBR600
Transmittance (%)
Wave number (cm-1)
3430
3269
2927
2856
1706
1600
1422
1038
860

Fig.1

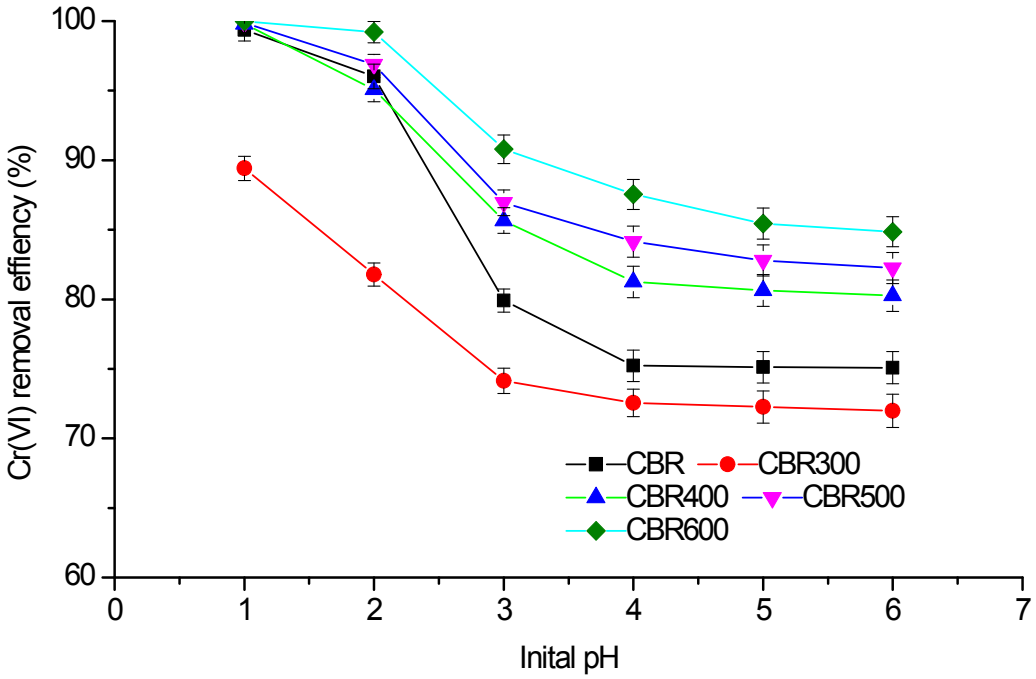
Cr(VI) removal effiency (%)
Inital pH
CBR
CBR300
CBR400
CBR500
CBR600

Fig.2

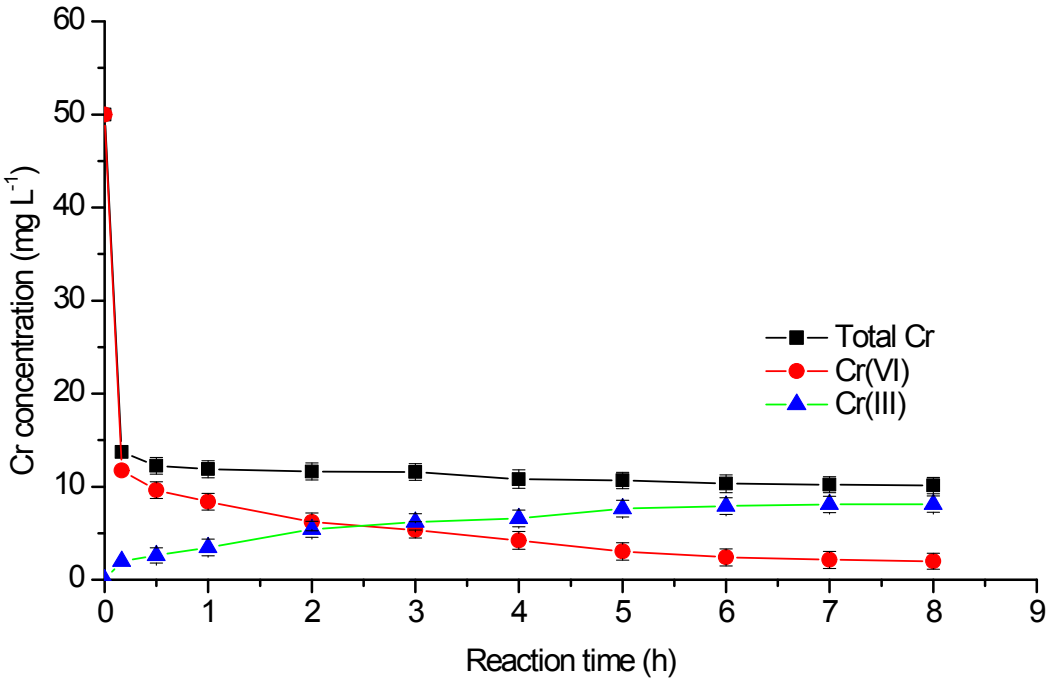
Cr concentration (mg L-1)
Reaction time (h)
Total Cr
Cr(VI)
Cr(III)

Fig.3

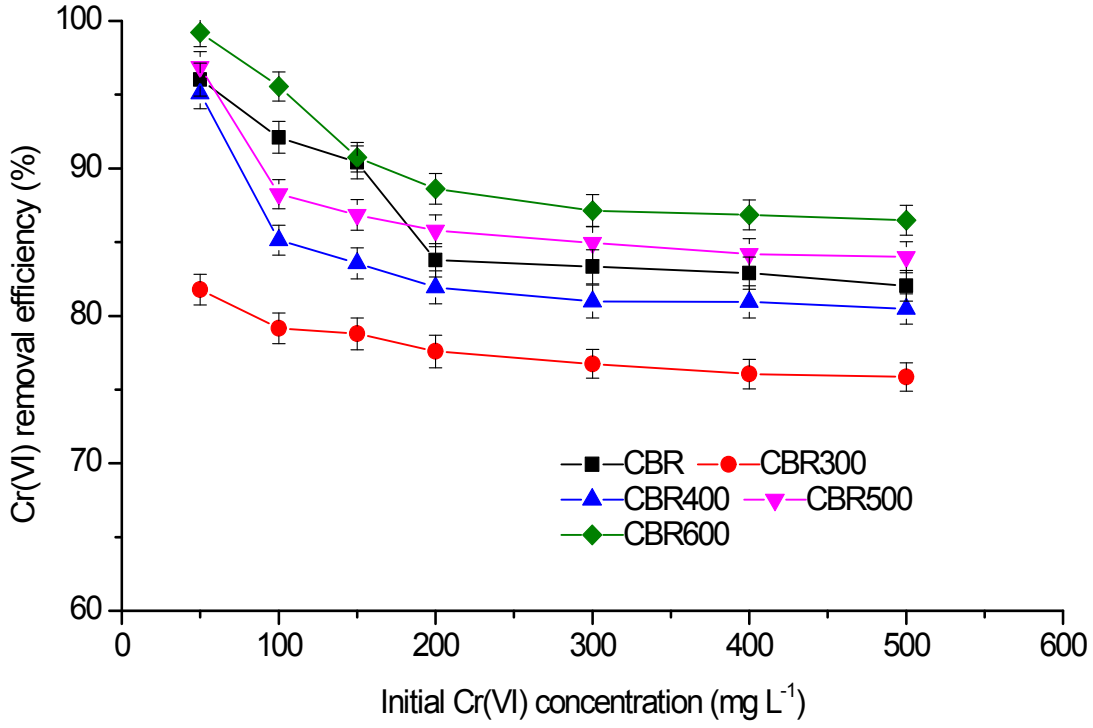
Cr(VI) removal efficiency (%)
Initial Cr(VI) concentration (mg L-1)
CBR
CBR300
CBR400
CBR500
CBR600

Fig.4

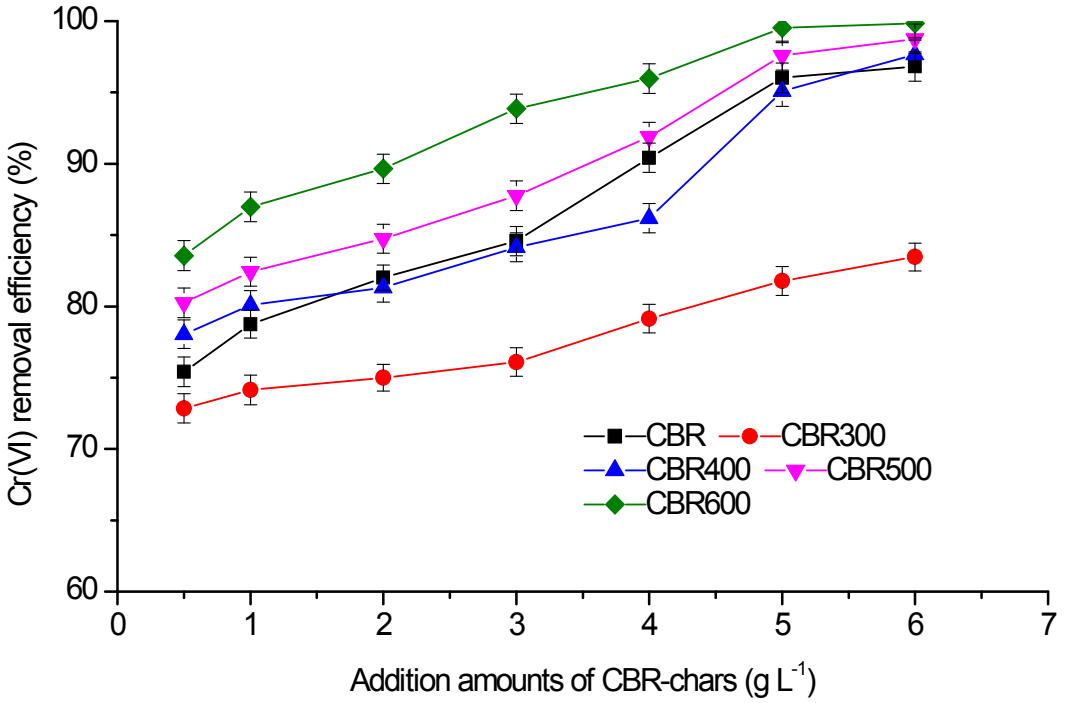
Cr(VI) removal efficiency (%)
100
90
80
70
60
0
1
2
3
4
5
6
7
Addition amounts of CBR-chars (g L-1)
CBR
CBR300
CBR400
CBR500
CBR600

Fig.5

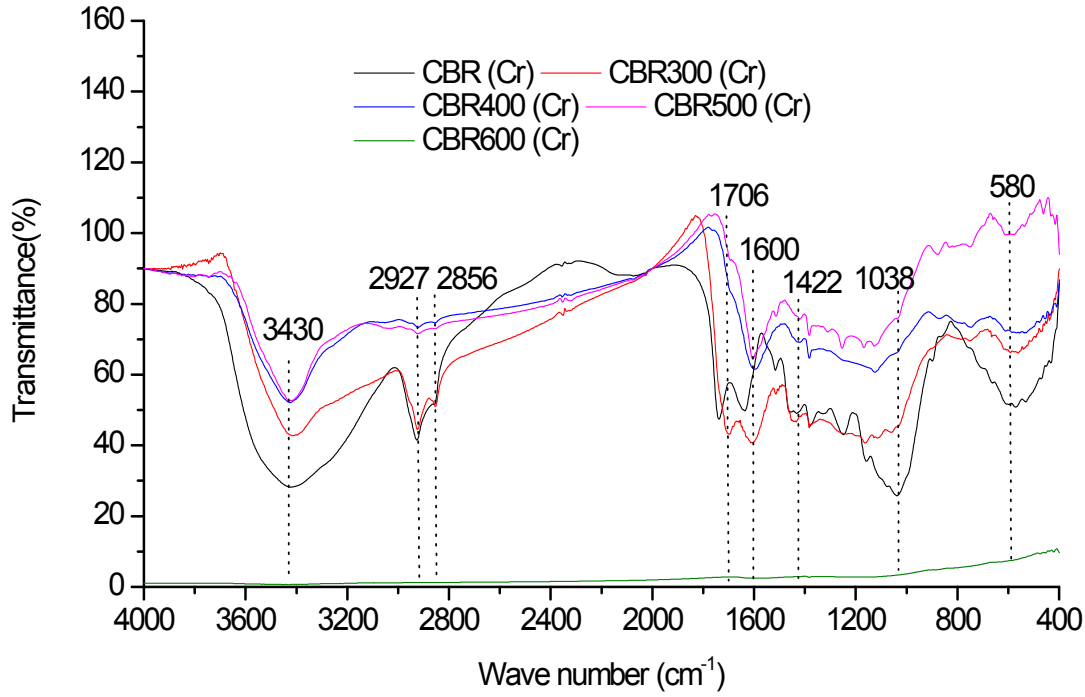
Transmittance(%)
160
140
120
100
80
60
40
20
0
4000
3600
3200
2800
2400
2000
1600
1200
800
400
Wave number (cm-1)
CBR (Cr)
CBR300 (Cr)
CBR400 (Cr)
CBR500 (Cr)
CBR600 (Cr)
3430
2927
2856
1706
1600
1422
1038
580

Fig.6