

Supplementary Information

Table 1 the relative peak area percentages of C1S XPS spectra

sample	C=C/C-Hx/C-C(%)	C-O(%)	C=O(%)	O-C=O(%)
10h	0.37	0.35	0.14	0.13
18h	0.35	0.31	0.18	0.17
22h	0.34	0.28	0.19	0.19
26h	0.33	0.25	0.21	0.21
28h	0.35	0.24	0.17	0.24
44h	0.38	0.35	0.27	0.00

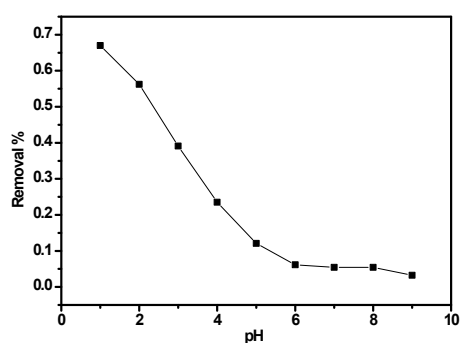


Fig.1. Effect of initial pH on adsorption of Cr(VI) by hydrochar (under the conditions: adsorbent dosage 0.1 g, rotate speed 120 rpm, temperature:20 C, contact time 120 min h and $C_0=50 \text{ mg L}^{-1}$).

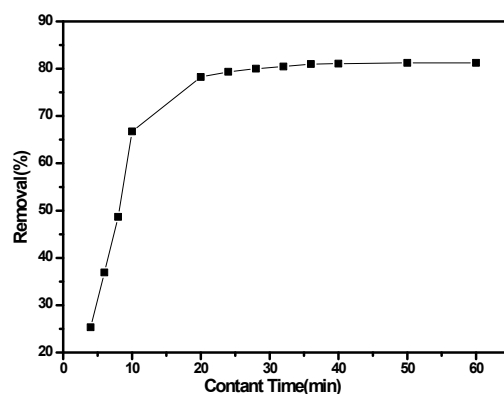


Fig.2 Effect of contact time on adsorption of Cr(VI) by hydrochar (under the conditions: adsorbent dosage 0.1 g, rotate speed 120 rpm, temperature:20 C, contact time 240min and $C_0=10 \text{ mg L}^{-1}$).

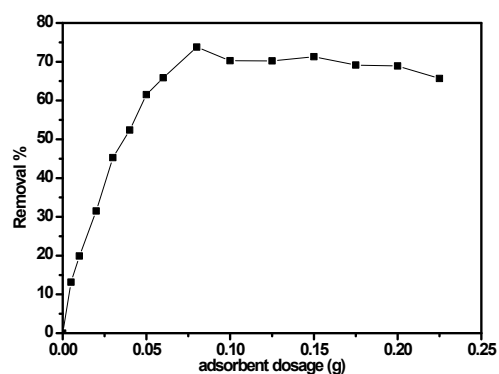


Fig.3. Effect of adsorbent dosage on adsorption of Cr(VI) by hydrochar (under the conditions: adsorbent dosage 0.1 g, rotate speed 120 rpm, temperature: 20 °C, contact time 240 min and $C_0=10 \text{ mg L}^{-1}$)

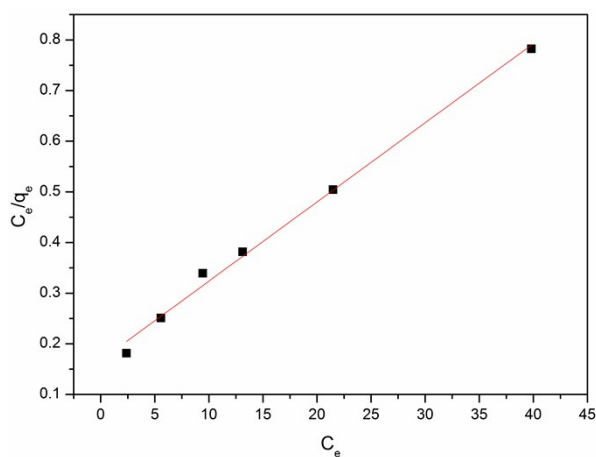


Fig.4. Langmuir isotherm for adsorption of Cr(VI) (under the conditions: adsorbent dosage 0.1 g, rotate speed 120 rpm, temperature: 20 °C, contact time 120 min and $C_0=50 \text{ mg L}^{-1}$).

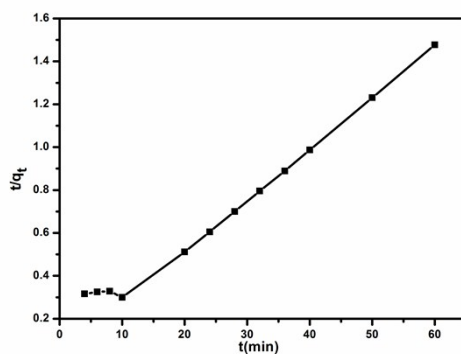


Fig.5. Second-order plot for the adsorption of Cr(VI) (under the conditions: adsorbent dosage 0.1 g, rotate speed 120 rpm, temperature: 20 °C, contact time 120 min and $C_0=50 \text{ mg L}^{-1}$).