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Removal behaviors and mechanisms of hexavalent chromium from aqueous solution by cephalosporin residue and derived chars

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Abstract: Cephalosporin residue (CR) was used to produce biochar (BC) and activated carbon (AC) at 600 °C (BC600 and AC600). To compare the removal behaviors and mechanisms of Cr(VI) by CR and derived chars, batch adsorption tests were performed in Cr(VI) microenvironment like pH, Cr(VI) concentration, adsorbent dosage, combining with the characterization of adsorbents before and after adsorption. Fourier transform-infrared spectroscopy (FT-IR), X-ray diffraction (XRD), scanning electron microscope (SEM), energy dispersive spectroscopy (EDS), and Brunauer-Emmett-Teller (BET) techniques were used. Results showed that the Cr(VI) removals by CR and CR-chars fitted Freundlich and Langmuir models. Based on the Langmuir model, the maximum adsorption capacities of CR, BC600 and AC600 towards Cr(VI) were 107.41, 88.19 and 74.07 mg g⁻¹, respectively. The CR rich in dissolved carbon (DOC), -NH₂ and -COOH, chiefly acted as chelating and reducing agents, while the AC600 with high surface area mainly supported Cr(VI) adsorption during Cr(VI) removal process.

Keywords: Cephalosporin residue; Biochar and activated carbon; Hexavalent

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