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Optimized removal of Oxytetracycline and Cadmium from contaminated waters using chemically-activated and pyrolyzed biochars from forest and wood-processing residues

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Abstract

In the present investigation, the adsorptive removal of the antibiotic drug oxytetracycline (OTC) and toxic heavy metal cadmium (Cd) from aqueous solution was carried out using forest and wood-processing residues. Numerous biochars were prepared using different chemical agents (H_3PO_4, H_2SO_4, NaoH and KOH) and pyrolysis times and temperatures. Several elemental, chemical and structural characterizations were performed. The optimum conditions for pyrolysis to enable the production of biochars with well-developed porosity was 600 °C for 1 h, for both residues. The adsorption process using selected activated biochars was optimized with respect to reaction time, pH, temperature and initial load of pollutants. Under optimized operating conditions, and based on equilibrium modeling data, the biochars which showed the highest removal efficiencies of OTC and cadmium were "5M H_3PO_4 forest" (263.8 mg/g) and "1M NaoH forest" (79.30 mg/g), respectively. Compared to adsorbents reported in the literature, the efficiencies of those biochars are highly competitive.