

Synthesis and adsorption of magnetic biochar as an adsorbent for Cr (III) cations removal from aqueous solutions

Frolova L., [Kharytonov, M.](#), Klimkina I., Kovrov O., Cherkasova M.

In this work we propose obtaining a composite magnetic biochar based on biochar of coniferous trees, studying its properties, checking its adsorption abilities, and comparative analysis of its adsorption properties with precursors (magnetite and biochar).

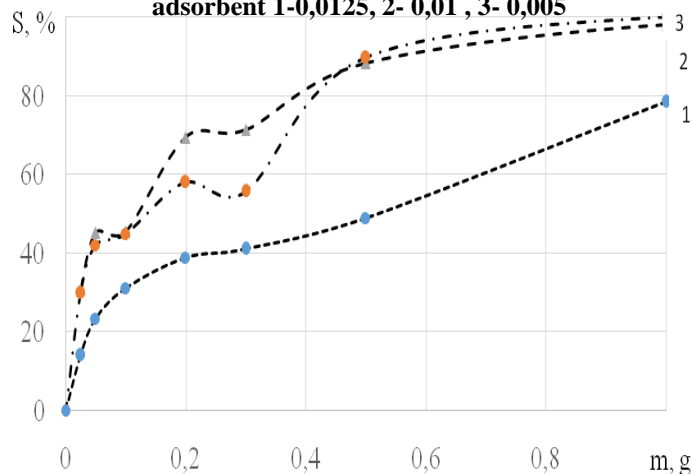
Introduction:

Chromium and its compounds are widely used in various industries. This is based on its valuable properties such as heat resistance, hardness and corrosion resistance. As an alloying additive, chromium is used for smelting various grades of steel and alloys, which are used in the engineering, aviation, and space industries. Chromium oxides are the raw material for the preparation of polishing pastes, paints for glass and ceramics, and are part of chromium-containing catalysts. Chromium salts are used in the production of anticorrosive pigments and electroplating. All these technological processes lead to the formation of a large amount of concentrated wastewater. Chromium (III) compounds, especially chromium (VI), are toxic to humans and animals.

Conclusions:

A new magnetic biochar was successfully synthesized using a coniferous biochar using plasma processing. The results showed the high efficiency of the magnetic adsorbent combining the high adsorption capacity of the initial biochar with magnetite magnetic properties. The prepared magnetic biochar showed a wide network of pores due to the dispersed magnetite on the surface. Magnetic biochar showed high magnetic characteristics of coercivity 50 Oe and saturation magnetization 40 Emu/g. The ability to remove Cr(III) varies from 32 ± 0.5 mg/g of biochar to 140 ± 0.5 mg/g for magnetic biochar at an initial range of concentrations of Cr (III) of 0.0125; 0.01; 0.005 mol/l. As can be seen from their IR spectra, functional OH groups on the surface of the biochar promote adsorption. The mechanism of adsorption of Cr (III) by a biochar mainly includes the chemisorption process and cations attached to the biochain matrix. It can also explain the significant adsorption capacity of a magnetic biochar that combines a developed and hydrated surface.

Dependence degree of the adsorption on the mass on the adsorbent 1-0,0125, 2- 0,01 , 3- 0,005



SEM images of adsorbents: BC (a), magnetic biochar(b)

