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Adsorption and removal of organic pollutants from aqueous media on biochars obtained from agro-industrial waste

Adsorbția și îndepărtarea *poluanților organici din medii apoase pe biocărburi obținuți din deșeuri agroindustriale*

Given the growing concerns about water contamination with organic pollutants and the need for decontamination with environmentally friendly sorbents, biochars were prepared from apple juice waste and subsequently activated by incorporating metal oxides in different proportions. After basic and thermal treatment, the resulting samples (A-ac) present an ordered and uniform porous structure with a narrow pore size distribution. Upon addition of Fe_3O_4, the surface area and the porous structure are affected only to a small extent. The same narrow pore size distribution is observed, with a bimodal appearance. For samples containing NiO, the surface area decreases, which is explained either by the collapse of the porous

structure or by the filling and clogging of the pores existing in the carbon precursor. The synthesized materials were characterized using the BET surface analysis method. The surface area and pore size distribution were calculated from nitrogen adsorption-desorption isotherms. Activated (A-ac) and Fe_3O_4-functionalized (A-ac-Fe_3O_4) biochars showed the highest specific surface area (1208 and 1065 m^2/g, respectively). Subsequently, the removal efficiency of dibutyl phthalate (DBP) from aqueous solutions was investigated. At a fixed adsorbent/solution ratio, various factors affecting DBP adsorption were analyzed: pH, pollutant concentration and temperature. The maximum DBP adsorption capacity was 34 μmol/g, being attested at pH 4.0-4.5. No essential variation in the sorption capacity was attested in the temperature range 25- 65 °C. The pollutant removal efficiency ranged from 68–75%, highlighting the sustainable potential of apple waste derivatives fortified with metal oxides for the removal of organic pollutants from water.

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