F.25. PHTHALATE CONTAMINATION IN ENVIRONMENTAL MATRICES AND EFFICIENT REMOVAL USING METAL OXIDE–FUNCTIONALIZED APPLE WASTE BIOCHAR

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Abstract. The aim of the present study was to evaluate the contamination of environmental matrices - water, agricultural soil and grapes - with plasticizer residues, as well as to analyze the sorption process of phthalate residues from aqueous solutions on biochar derived from apple waste. The capacity of pollutant removal by sorption processes on biochar can be improved by activation processes, thus the biochar was functionalized with metal oxides (Fe_3O_4 and NiO). The synthesis of biochar-based nanocomposites allows combining the advantages of biochar with those of nanomaterials. The resulting composites present significant improvements in terms of surface functional groups, pore structure, surface active sites, catalytic degradation capacity and

degree of separation. Studies have shown that DBP and DEHP are the phthalate residues most frequently detected in the environmental samples considered. Although the water from Chisinau city sources is generally not problematic, significant residual concentrations of phthalates were detected in some vineyard soils, attributed to agricultural practices and treatments. Analysis of grapes from various plantations during the harvest period confirmed the presence of these residues. In order to prevent contamination of the food chain, it is essential to develop efficient sorbents capable of reducing the cumulative effects of exposure to environmental residues on human health. The adsorption behavior of DBP and DEHP on the developed biochar differs considerably due to the specific molecular properties of each compound: water solubility (11.2 mg/L for DBP and 0.003 mg/L for DEHP), molecular dimensions (length/width: 1.265/1.229 nm for DBP and 1.388/1.032 nm for DEHP), octanol-water partition complexation and hydrophobic interactions. DBP was predominantly adsorbed, probably due to steric factors and the compact structure of the DBP molecule. This observation is consistent with the L-shaped adsorption isotherms, which indicate that the molecules are arranged parallel to the biochar surface. The results of the study demonstrate that the nanometal oxide-biochar composites combine the distinct advantages of biochar and nanometal oxides, demonstrating considerable potential as adsorbents.

Keywords: water, pollutants, residual phthalates, nanometal oxides.

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