The adsorption properties of torrefied waste materials

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One of the perspective methods of thermal treatment is torrefaction, with which a product with better energy density was obtained. Torrefaction of raw biomass results in a product with better physico-chemical properties, such as improved higher heating value (HHV), grindability, hydrophobicity, etc. [1]. During the torrefaction process, the hydroxyl groups (-OH) are completely degraded, resulting in hydrophobicity of the torrefied biomass [2]. Torrefied biomass can be produced by thermochemical decomposition of biomass at temperatures of 200 to 350 °C in the presence of little or no oxygen. The biofuel produced can then be used for energy purposes and as an adsorption material. Carbonaceous materials have long been used as sorbents for organic and inorganic pollutants in soil and water [3, 4]. The main purpose of the research is to determine the conditions of the torrefaction process and the type of feedstock as the main factors affecting the sorption behaviour of torrefied material. Various feedstocks such as wood biomass, animal bedding, hops and miscanthus are used to produce biochar by torrefaction. The torrefaction temperature in these studies varied from 200°C to 350°C, in CO_2 and N_2 atmosphere. The hydrophobicity of the produced solid is analysed by measurements in TGA/ DSC $^{3+}$. In addition, the adsorption properties of the produced materials will be investigated. The research will mainly focus on the adsorption of copper, nickel, and chromium. Subsequently, the adsorption of the individual metal ions will be investigated using model solutions. The mass concentration of the metal ions will be determined using spectroscopic techniques. The results of the analyses will be evaluated using the Freundlich and Langmuir models.

References

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