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Investigation of tannic acid adsorption by a magnetic composite sorbent obtained from spent coffee grounds

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Abstract

Magnetic composite materials based on the spent coffee grounds and magnetite particles were obtained. The adsorption capacity of the composites towards tannic acid was determined using static approach. Concentration of tannic acid in solutions was determined spectrophotometrically. Samples of two kinds were compared, namely: the original samples and the samples, for which coffee was preliminarily treated with sodium hydroxide. For both samples the point of zero charge was determined by immersion method, the influence of pH value at adsorption activity was studied. Variation of pH value in the range 2-6 was shown to have a weak effect on sorption. Kinetics of tannic acid sorption was investigated; time of achieving sorption equilibrium was found to approximately 24 hours. Adsorption isotherms were obtained at 25 ^{o}C. The adsorption isotherms were evaluated for the correspondence with Langmuir and Freundlich models. Original and treated with hydroxide composites were shown to fit both Langmuir and Freundlich equations. Preliminary alkaline treatment of the spent coffee grounds promoted an increase of the sorption efficiency of the magnetic composite.

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