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# The preparation of hydrazide humic acids and the study of their complexation with copper(II) ions

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**Abstract**

A modified method for isolating humic acids from brown coal has been developed. It was established that the most complete isolation of the initial humic acids from brown coals occurs when the solution is extracted with 4% NaOH solution, the optimal extraction time is 4 hours at a temperature of 80 °C. From the obtained humic acids with the use of hydrazine hydrate hydrazides of humic acids were synthesized and the optimal ratios of humic acids and hydrazine hydrate were determined – the greatest yield of humic acid hydrazides is obtained at a ratio of 1 g of humic acid – 1 ml of hydrazine hydrate and is 2.9%. The reactions of complex formation of humic acids and their hydrazide derivatives with copper(II) ions were studied. The maximum sorbability of copper(II) was achieved after 120 minutes of the interaction of copper(II) with the sorbent, and the sorption of copper(II) ions by humic acid hydrazides significantly exceeded sorption by the initial humic acids. The ways of possible chemical modifications of functional groups (aldehyde, ketone, ester, carboxylic, carboxamide) in humic acids are discussed in the interaction with hydrazine hydrate. Using the method of IR spectroscopy, the possibility of forming new different functional groups capable of chelating copper(II) ions: hydrazides, hydrazones, amidrazones and azines is shown, depending on the conditions of interaction with hydrazine hydrate of functional groups in the initial humic acids. The obtained results can be used for further modification of humic acids by various organic reagents and for the development of methods for remediation of contaminated heavy metal ions of soils, neutralization of industrial and domestic waste and wastewater treatment using chemically modified humic acids.

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