Book of Abstracts

Ninth International Conference of the CIS IHSS
on humic innovative technologies
"Humic substances and green technologies"
(HIT-2024)
October 25-28, 2024
Sailing Club “Vodnik”, Moscow Region, Russia

Edited by Irina V. Perminova,
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Desktop publishing by Konstantin S. Larionov
Cover design by Alla Komarova

Non-Commercial Partnership “Center for Biogenic Resources “Humus Sapiens” (NP CBR “Humus Sapiens”)

http://www.humus.ru/hit-2024
Moscow – 2024

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CONTENTS

Synthesis of magnetic sorbents with humic substances for the removal of heavy metals from natural waters

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Keywords: humic substances, hematite, sorption, magnetite.

Waste from metallurgical enterprises accumulates as tailings containing hematite and residual sulfides, which can leak into the environment during accidents or malfunctions. This contamination leads to ecosystem degradation, characterized by a decrease in the pH of drainage waters, increased metal mobility, and deteriorating water quality. As a result, contaminated soils become unsuitable for plant growth, posing a threat to the survival of numerous species.

In this study, we propose the use of magnetite immobilized on a solid carrier—sawdust treated with humic substances—to create an effective sorbent with an enhanced surface area. To achieve this, iron (II) and (III) salts were mixed with sawdust, followed by the precipitation of magnetite using an ammoniacal solution of coal humic acids under heat. The resulting sorbent was then filtered and dried.

We investigated the sorbent's ability to adsorb copper and hematite from natural waters, comparing its performance to that of untreated sawdust. Characterization of the sorbents was conducted using various physicochemical methods. X-ray phase analysis and Mössbauer spectroscopy confirmed the dominance of the magnetite phase in the synthesized materials. Micro X-ray fluorescence analysis and scanning electron microscopy revealed a uniform distribution of magnetite across the surface. Additionally, magnetic field measurements indicated notable magnetic properties, which were enhanced in the absence of humic acids.

To validate the high sorption capacity of the modified sorbent, we conducted experiments focusing on the adsorption of copper and suspended hematite. The results indicated that untreated sawdust exhibited minimal adsorption capabilities: maximum copper adsorption was only 4 mg/g, while for hematite it reached 20 mg/g. In contrast, the modified sorbent displayed significantly improved adsorption rates: 7.8 mg/ml for copper and 80 mg/g for hematite. Thus, modifying sawdust with magnetite in the presence of humic acids enhances adsorption efficiency, facilitating the ecological disposal of contaminants.

Acknowledgements. This research was carried out within the framework of the state task “Ecology” (CITIS no. 122040600057-3).