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**STUDY OF HUMIC SUBSTANCES AS REAGENTS FOR THE PURIFICATION OF CONTAMINATED WATER**

Efficient complex use of coal resources requires knowledge of their raw material capabilities and properties. Every year, the scope of lignite application is growing due to its low cost and significant reserves [1]. Lignite can be transformed into valuable components for the chemical industry through the processes of extraction, oxidation, semi-coking, coking, gasification, thermal dissolution, hydrogenation, etc [2-4].

One of the main areas of non-traditional use of lignite is production of humic acids (HAs) [5-7]. Their group composition includes bituminoids, humic substances and residual coal. They belong to the high-molecular aromatic oxycarboxylic acids by chemical composition. HAs are of practical interest as selective sorbents due to their properties as good complexing agents.

Given the significant deposits of lignite in Ukraine, innovative technologies for its use are promising [8-10]. One of the methods could be the production of water-soluble sorbents from lignite to absorb heavy metal ions, which are becoming a dangerous source of pollution. They cannot be removed from water by mechanical means, biological treatment and traditional methods such as coagulation and flotation. This makes it necessary to control their release into the environment and requires the use of relatively inexpensive, accessible means of capturing them.

To solve this issue, barometric methods such as ultrafiltration are used [11]. The effectiveness of ultrafiltration membranes is ensured by reagents capable of binding heavy metal ions into complexes and concentrating them on the membrane surface. This makes it possible to purify water from traces of metals to maximal accepted concentrations and isolate them using conventional, cost-effective methods. To implement the method, synthetic water-soluble products are currently used as complexing agents [12, 13]. The disadvantage of synthetic complexing agents is their transformation into filtrate and entering natural water sources as well as their high cost. Complexing agents derived from natural raw materials, humic acids derived from lignite in particular, do not have such disadvantages.

HAs are anionic polyelectrolytes and belong to the natural absorbers of numerous pollutants [14-16] due to the presence of oxygen-containing functional groups and nitrogen-containing heterocycles, which can selectively bind to metal ions, forming strong complexes.

Thus, the discovery and development of non-energy methods of lignite use is a very promising scientific and practical task.

The study was conducted on a batch of lignite from the Oleksandriya deposit in Ukraine. The following values were determined: moisture content – 10.54 %, volatile-matter yield – 31.08 %, ash content – 39.51 %, total sulphur content – 0.74 %. The quantitative content of HA, which is 38.67 % mass, was determined by the Erdman's method. The content of fulvic acids was determined by the photometric method with pH = 2. For the comparison, a 0.01 n aqueous solution of H2SO4 was used. The content of fulvic acids, which is 0.21 %, was determined according to the calibration dependence.

The content of copper ions in water was determined in the initial solution and after the addition of HA using the iodometric method of analysis:

2Cu2+ + 4І- = Cu1І2↓ + І2.

To a sample of the original aqueous solution (20 ml), 2 ml of H2SO4 (1:4) and 10 ml of KCl+KI were added and the released iodine was titrated with sodium thiosulfate ( Na2S2Оз) with the addition of starch (2-5 ml). The starch is added when the solution becomes straw-coloured and titrated to a fuzzy purple colour. The calculated copper content amounted to 0.110 mg/l. The determined degree of purification was 86.36%.

The analysis of the data demonstrates that humic substances can provide a high level of water purification from copper ions and are promising for the production of water-soluble sorbents based on them.

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