DEVELOPMENT OF OPTIMAL CONDITIONS FOR EXTRACTING OF TOLUOL EXTRACT AND HUMIC ACIDS FROM BROWN COAL

Lysenko L., Miroshnichenko D.
National Technical University
Kharkiv Polytechnic Institute, Kharkiv

The aim of the study is to develop optimal conditions for obtaining toluene extract and humic acids from brown coal of Ukraine, as well as to determine their proximate and ultimate analysis, aromatic carbon content, degrees of hydrogen unsaturation and molecular association of organic matter.

To determine the yield of toluene extract and humic acids used standardized methods such as ISO 975:2021 Brown Coals and lignites – Determination of yield of benzene-soluble extract – Semi-automatic method та ISO 5073:2021 Brown coals and lignites – Determination of humic acids.

In addition, 3 methods were developed for obtaining toluene extract and humic acids, which differed from the standardized by weight of the sample, extraction conditions, volume and concentration of reagents, the procedure for extracting toluene extract and humic acids.

It has been found that milder extraction conditions lead to a decrease in toluene extract yield from 14.86 to 5.32 %. At the same time, increasing the amount and concentration of NaOH leads to an increase in the yield of humic acids from 41.0 to 51.7 %. If the quality indicators of toluene extract were practically unchanged, the quality of humic acids has undergone some changes: the carbon content has fallen from 57.4 to 51.8 %; hydrogen content increased from 3.8 to 4.5 %, $N^d+S^d_t+O^d_d$ content increased from 34.9 to 38.4 %.

Determination of the yield of free humic acids to determine the yield of toluene extract from brown coal leads to the fact that the yield of free humic acids is 47.39-48.32 % and the yield of toluene extract 1.79-5.28 %, moreover, the use of the extraction apparatus significantly (almost 3 times) increases the yield of toluene extract. Indicators of ultimate analysis of humic acids are: C^d=61.7-61.8 %; H^d=4.0-4.1 %; $N^d+S^d_t+O^d_d$=29.1-29.2 %, quality indicators of toluene extract are: C^d=79.6-79.9 %; H^d=12.6-12.9 %; $N^d+S^d_t+O^d_d$=6.9-7.5 %.

The yield of toluene extract from humic acids was further determined. It was found that it is possible to further remove 0.48 % of toluene extract from humic acids.

For the first time, studies were performed on the influence of conditions (weight of the sample, extraction conditions, volume and concentration of reagents, procedure for extraction of toluene extract and humic acids) of toluene extract and humic acids on their yield and quality indicators.

The implementation of the research results will allow to regulate the yield and quality indicators (proximate and ultimate analysis) of toluene extract and humic acids. The use of the developed methods will help increase the profitability of enterprises specializing in the extraction of toluene extract and humic acids from brown coal in Ukraine.