STUDY OF THE COMPOSITION OF THE ASH PART OF HARD COAL AND ITS RELEVANCE

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Annotation

This article presents the results of studying the chemical structure of coal ash. This reveals their mineralogical nature and makes it possible to identify various elements and compounds that can determine the properties of coals as potential adsorbents. Analysis of the chemical composition of ash from various coal samples showed a significant diversity in the content of key elements such as oxides of silicon, aluminium, iron and calcium. Differences in the content of SiO_2 and Al_2O_3 between the samples are especially noticeable. Such data emphasize the need to take into account the chemical and mineralogical composition of coal when used as a starting material for adsorbents. This will optimize the characteristics of the resulting materials and increase their efficiency.

Keywords: silicon, aluminum, oxide, carbon, adsorbent, activation, temperature, humidity, analysis, ash.

The study of the chemical and mineralogical features of the ash component of coal is the focus of attention in the development of coal adsorbents. The inorganic fraction of coal that remains after its combustion includes various minerals that affect the properties of adsorbents and their ability to retain various elements from the environment [1–2].

Determination of the chemical and mineralogical content of this fraction makes it possible to reveal the presence of elements such as Si , Al, Fe, Ca , Mg , S, etc. These components can play a key role in adsorption, determining the surface characteristics of adsorbents, their electrostatic properties, and the specifics of substance retention.

By analyzing the ash component of coal, the various mineral stages can be identified and their key characteristics, such as crystal structure, surface properties, and reactivity, can be identified, which can affect the adsorption process and interaction with target elements.

This knowledge of the composition and properties of the ash component of coal serves as the basis for improving the development of coal adsorbents, helping to select the best types of coal, set processing parameters and modifications in order to achieve the desired adsorption properties.

Thus, the study of the chemical and mineralogical profile of the ash component of coal is the key to the development of effective coal adsorbents. This line of research allows us to consider in detail the properties of coal and improve methods of its processing to obtain adsorbents with the desired characteristics.

The amount of carbon and ash in the samples was determined by the method of complete combustion in a tube furnace, based on the accelerated method according to ISS (international state standard) 2408.1-95.

To determine the structure and composition of the initial and processed coal, various methods were used, including X-ray phase diagnostics, spectral methods, and classical analytical chemistry in accordance with regulatory documents [3, 4].

Table 1. Chemical composition of coal ash

Sample	Content in % air dry matter											
	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MgO	MnO	CaO	Na_2O	K_2O	P_2O_5	SO_3	ppp
WCLWWSG1	28.84	0.17	9.55	20.25	1.81	0.36	16.56	0.18	0.19	1.10	18.36	<0.1
WSSG1	56.97	0.69	21.61	4.84	1.01	0.05	14.62	0.37	1.35	0.14	3.50	3.10
SPG1	59.88	0.81	21.78	4.94	0.91	0.03	14.95	0.18	1.58	0.12	2.24	3.12

All investigated coal samples show a high content of silicon oxide (SiO_2). In the ash of sample WCLWWSG1 (weakly caking large walnut with small group 1) it is 28.84%, WSSG1 (while in weakly spicy seed of group 1) and (skinny private group 1) its share reaches 56.97% and 59.88%, respectively. This indicates the predominance of silica in the ash of these coals.

In sample WCLWWSG1, the concentration of aluminum oxide (Al_2O_3) reaches 9.55%, while for samples WSSG1 and SPG1 (skinny private group 1) this figure is 21.61% and 21.78%. This confirms the high presence of aluminum in their ash constituents.

Iron oxide (Fe_2O_3) is present in each of the samples. In the WCLWWSG1 ash, its share is 20.25%, while in WSSG1 and SPG1 it is only 4.84% and 4.94%, respectively. It follows from this that WCLWWSG1 has the highest iron content among the examined samples.

The content of calcium oxide (CaO) in the ash varies from 14.62% in WSSG1 to 16.56% in WCLWWSG1, emphasizing a significant proportion of calcium in the ash component of coals.

Samples WSSG1 and SPG1 include certain amounts of oxides of phosphorus (P_2O_5) and sulfur (SO_3), while WCLWWSG1 shows the minimum content of SO_3 (less than 0.1%). This may indicate different concentrations of phosphorus and sulfur in different coals.

Other elements have also been found in the composition of coals, for example, oxides of titanium (TiO_2), magnesium (MgO), manganese (MnO), sodium (Na_2O) and potassium (K_2O), and their proportion varies from traces to several percent. .

The study of the chemical structure of coal ash reveals their mineralogical nature and makes it possible to identify various elements and compounds that can determine the properties of coals as potential adsorbents. Analysis of the chemical composition of ash from various coal samples showed a significant diversity in the content of key elements such as oxides of silicon, aluminium, iron and calcium. Differences in the content of SiO_2 and Al_2O_3 between the samples are especially noticeable. Such data emphasize the need to take into account the chemical and mineralogical composition of coal when it is used as a starting material for adsorbents. This will optimize the characteristics of the resulting materials and increase their efficiency.

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