POSSIBILITIES OF OBTAINING PRIMARY RAW MATERIALS FROM SECONDARY KAOLIN

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Abstract. *Currently, with the depletion of aluminum-rich raw materials, the need for high-quality bauxite raw materials in the aluminum industry worldwide is increasing every year. At the same time, it is necessary to extract the necessary components from low-quality aluminum raw materials - high-silicon bauxite, kaolin clay, alunite rocks, nepheline and other ores.*

Keywords: *waste kaolin, technogenic waste, firing, leaching, neutralization, sodium aluminum, modification.*

Nowadays, with the continuous development of science and technology in our Republic, all spheres of life place high demands on various indicators of kaolin, especially in paper, coating, rubber and other industries, the demand for high-quality kaolin continues to grow. The modification of kaolin can change the physical and chemical properties of its surface, thereby increasing its added value, which can meet the needs of today's new technologies, new technologies and new materials.

In the upper part of the Angren coal layer of Tashkent region, there is a secondary kaolin layer, and below the coal layer there is a primary kaolin layer. Currently, the reserve of secondary kaolin is 1.4 million tons, its content is Al_2O_3 9-13%, Fe_2O_3 0.5-4 .5%, SiO_2 55-80% and others are available. Secondary kaolin is not used due to the low content of aluminum and the high amount of harmful additives. Due to the decrease of natural aluminum-containing raw materials from year to year, the processing of secondary raw materials of aluminum to obtain aluminum oxide is becoming relevant nowadays.

Due to the low amount of aluminum oxide and other valuable components in the secondary Angren kaolin, the aluminum is in the form of a complex compound, the amount of additives is large and the structure is complex, it is currently not processed and enriched, it is collected as man-made waste and causes environmental problems. Therefore, it is important to process secondary Angren kaolin, to enrich its content of Al_2O_3 and to increase the content of primary kaolin.

Methods of beneficiation of secondary Angren kaolin by alkaline calcination were studied. Sodium hydroxide was chosen as the reagent for alkaline caustication. Firing temperatures from 250°C to 500°C were studied. As a result of the conducted studies, it was determined that the optimal temperature of incineration is 350°C. The incineration temperature depends on the modification of aluminum oxide in kaolin content [1].

When kaolin is burned with sodium hydroxide at 350°C, the modification of aluminum oxide changes, that is, it changes to a separate form. When the temperature is raised to 500°C, aluminum combines with sodium hydroxide to form sodium aluminate. Sodium aluminate is easily soluble in water. Since the purpose of the research work is to leave aluminum oxide in the residue, the optimal temperature of kaolin sample calcination with alkali was assumed to be 350°C.

Sodium aluminate is easily soluble in water. In this research work, it is desirable to leave the aluminum oxide in the residue as much as possible without transferring the aluminum oxide to the solution when burning the kaolin sample with alkali. Therefore, the optimum temperature for the process was assumed to be 350 °C. Silicon oxide in kaolin reacts with sodium hydroxide even at relatively low temperatures to form sodium metasilicate (Na_2SiO_3). Sodium metasilicate is easily soluble in water. The goal of the process is to dissolve the silicon oxide by selectively dissolving the sample in water after the calcination process [2].

When the results were studied, it was found that the maximum amount of aluminum oxide (25.06%) was at the temperature of 350 °C. Therefore, 350 °C was taken as the optimum temperature. The effect of firing temperature on the chemical composition of kaolin is presented in Table 1.

Table 1.

Effect of burning temperature on the chemical composition of kaolin

№	T, °C	Mass fraction, %		
		SiO_2	Al_2O_3	Fe_2O_3
1	250	70,85	19,7	0,475
2	350	62,6	26,1	0,459
3	400	27,52	17,81	0,501
4	500	13,9	7,05	0,503

As can be seen from Table 1, the amount of aluminum oxide in kaolin significantly increases after calcination with NaOH.

The soot from the furnace was selectively dissolved in 350 ml of water at a temperature of 50 °C in a magnetic stirrer. Duration of the procedure - 40 minutes. After selective dissolution, the solution was filtered. In the filter, the residual mass is sent to the next hydrometallurgical process, i.e., selective acid dissolution.

According to the results of the analysis of the solution, as a result of burning Angren kaolin at high temperature with alkali (NaOH), the compound of aluminum oxide and silicon oxide in a complex form separates from each other, that is, it changes to a separate form. For this reason, the main part of silicon oxide passes into the solution in the process of selective melting. In addition, a large part of iron oxide also passes in the composition of the solution.

After selective dissolution in distilled water and filtration, the residual mass in the filter is selectively dissolved in 45% sulfuric acid in a magnetic stirrer at a temperature of 50 °C for 120 minutes. When the solution was cooled, crystals formed at the bottom of the container [3].

After selective dissolution, the solution was filtered. Analysis results of the mass component remaining in the filter, %: SiO_2-21,324; Al_2O_3-0.944; Fe_2O_3-0.346; TiO_2-0.068.

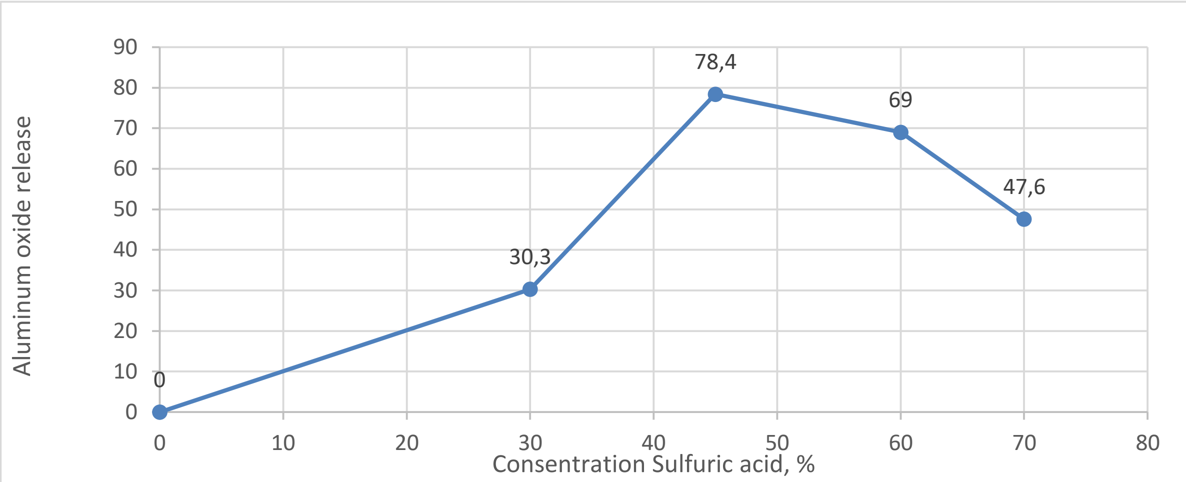
According to the results of the analysis, the main part of silicon oxide, iron oxide and titanium oxide was not dissolved in the process of selective melting, that is, it remained in the cake.

A selective dissolution process using 15% H_2SO_4 was used to extract aluminum oxide. The influence of sulfuric acid concentration on the level of aluminum oxide extraction is presented in Figure 1.

Dependence of sulfuric acid concentration on the level of aluminum oxide release.

According to the results of the conducted experiments, it is much easier to clean Angren coal mine kaolin from other harmful additives due to the separation of SiO_2 during the burning process. In addition, the purity of Al_2O_3 obtained is slightly increased.

1-picture.



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