

STUDY OF PHOSPHORUS-CONTAINING RAW MATERIALS OF THE KHARKIV REGION

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Stable operation of the chemical industry, producing mineral fertilizers, is possible only with the smooth supply of raw materials quality regulated [1]. The use of mineral fertilizers is one of the main criteria for increasing yields in agriculture. Complex fertilizers, which contain both nitrogen and phosphorus, are of particular importance. To provide agriculture with domestic complex fertilizers, technologies based on the use of phosphorus containing raw materials, which are located in Ukraine, are promising [2,3].

Ukrainian phosphorites belong to the class of low-grade, so their composition is the main criterion for different efficiency in their direct use [4]. Therefore, the development of a universal technology for the enrichment and processing of phosphorus-containing raw materials into mineral fertilizers is of particular practical interest. Considering the above and knowing that enrichment is a set of sequential operations, the purpose of which is to increase the content of nutrients, the first and mandatory stage of the technology is crushing the phosphorus-containing ore with its subsequent classification.

We found that the least studied are the phosphorites of the Synycheno-Yaremivske deposit, therefore the purpose of this work is to further study them.

Having carried out preliminary preparation of raw materials by crushing with subsequent classification, we visually determined that this ore is iron-containing, as indicated by the characteristic color. Therefore, we decided to carry out not only a chemical study, but also several physical ones, in order to accurately establish the composition of these phosphorites.

The next step was to establish the elemental composition using X-ray fluorescence analysis, as one of the modern spectroscopic methods [5, 6]. From the X-ray diffraction pattern of the phosphorus-containing ore of the Synycheno-Yaremivske deposit, obtained by X-ray fluorescence analysis, it can be seen that the highest content is in calcium and iron. In addition to these elements, the ore contains phosphorus, silicon, potassium, manganese, nickel, copper, zinc and chlorine.

In order to more accurately establish the qualitative composition, an analysis was carried out using electron microscopy with an attachment for energy dispersive analysis, especially since this analysis also shows the quantitative composition.

Analyzing the results of electron microscopy with an attachment for energy dispersive analysis, it can be concluded that the qualitative composition of the

phosphorus-containing ore of the Synycheno Yaremivske deposit is represented by such elements as sodium, magnesium, aluminum, silicon, phosphorus, sulfur, potassium, calcium, manganese, iron and oxygen. All elements were recalculated to chemical formulas, after which the ore has the following quantitative composition, %: Na_2O – 0.26, MgO – 1.03, Al_2O_3 – 0.91, SiO_2 – 20.75, P_2O_5 – 9.15, SO_3 – 0.43, K_2O – 1.32, CaO – 14.20, MnO_2 – 0.59, Fe_2O_3 – 51.35.

The first stage of beneficiation consisted in calcining the ore in a muffle furnace at a temperature of 680°C. Then, according to the method of determining the iron in the ore by boiling the latter in concentrated HCl, the content of ferrous and ferric iron was determined. As a result, the Fe_2O_3 content was obtained equal to 32.43 wt%, and FeO equal to 5.57 wt%. Accordingly, the total iron content in the ore is 38 % of the mass.

It has been confirmed that the studied ore is consistent with the data on the composition of phosphorites of the Kharkiv region, with the exception of an anomalously large amount of iron. The studies carried out indicate the possibility of enrichment of the P_2O_5 content in the ore. The data obtained indicate the possibility of using phosphorites of the Synycheno-Yaremivske district in the production of mineral fertilizers and metallurgy.

References:

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