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ANALYSIS OF OPERATIONAL CONTROL METHODS OF IRON ORE CHEMICAL AND MINERALOGICAL CHARACTERISTICS

It is necessary to have information about iron ore material composition and its chemical and mineralogical properties for controlling its grinding and classifying at the concentrating plants.

Existing methods for solving this problem were grouped according to the nature of the phenomena used: physical, optical, physicochemical, magnetometric, ultrasonic, and nuclear.

At the same time, using described methods in ore processing plants is impractical due to the long time required for analysis. It necessitates using of instrumental methods for controlling the material composition.The methods of operational control of the chemical and mineralogical characteristics of iron ore raw materials that have commonly used at enterprises specializing in iron ore enrichment can be divided into three types:

nuclear-physical, based on the interaction of gamma radiation with the rock mass being irradiated;

magnetometric, which uses the change in the relative magnetic permeability when interacting with magnetic iron;

ultrasonic, based on changes in the propagation of ultrasonic waves in the investigated material.

Let's analyze each of these methods.

The magnetometric method have based on the relationship between the magnetic iron content of iron ore and its magnetic susceptibility. This method allows for determining the magnetic iron content in the investigated material, but it does not provide information about total iron content.

The ultrasonic control method, based on the process parameters measurement of ultrasonic bulk and surface waves and high-energy ultrasound in liquid and solid media, is widely used in the mining industry. However, this method is critical to the particle size distribution of the investigated material, so its application to quality control of crushed ore is quite problematic.

The nuclear-physical method of controlling the chemical and mineralogical composition of mineral raw materials have based on the effect of the interaction of ionizing radiation with the substance of rocks and ores. The ore composition and its density have a significant impact on the intensity of the ionizing flux. The strength of the correlation between the above factors depends primarily on the number of components, their percentage in the ore, and their atomic number. If there are interfering components with large atomic numbers in the ore and their content is comparable to the content of the target component, then there is a weak correlation between the density and the content of the target component [1,2].

Consequently, it can be concluded that the nuclear-physical method of controlling the iron content in iron ore raw materials is one of the most promising for solving the problem of controlling the iron content in raw materials in ore processing plants. However, its accuracy is not satisfactory for operational control of the material composition of the initial iron ore raw materials of ore processing plants [3].

In this regard, the advancement of a nuclear-physical method for controlling the chemical and mineralogical characteristics of mineral raw materials and improving its accuracy is an essential and urgent scientific task.

References

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