

## Heat treatment of germanium-containing carbonaceous raw materials

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### Abstract

Germanium-containing coals and associated rocks (siltstones, mudstones) are one of the main sources of raw materials for obtaining germanium. However, at present, only coal is processed on a pilot scale by the method of layer combustion. Siltstone, because of its low carbon content, is unsuitable for burning by a layer method and for this reason is stored. Abroad, germanium from coal deposits is extracted using hydrometallurgical technology.

Analysis of existing methods for processing carbonaceous germanium-containing raw materials indicates the need to develop technology that meets modern technical, economic and environmental requirements. The article describes the results of modeling the process of cyclone melting of germanium-containing charges based on coal and siltstone. The technological parameters (temperature, sulfur content and basicity of charge) have been determined experimentally. It is established that an increase in the recovery of germanium (up to 94-95%) from the charge is achieved by saturation of the gas phase with water vapor. The degree of transition of the germanium and sulfur compounds to the gas is determined. Thus, the efficiency of processing of charge from coal and siltstone under the conditions of a cyclone unit during the combustion of gaseous fuels has been proved. In this case, the main products will be germanium-containing sublimates with a calculated germanium content of 1-2% and a molten slag with a basicity of about 0.4, contents of sulfur 3.0-3.4%. In the gas phase, nitrogen, organic oxidation products (carbon dioxide and water vapor), as well as sulfur (predominantly sulfur dioxide).

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