FEATURES OF ANORTHITE SYNTHESIS BY PLASMA METHOD*

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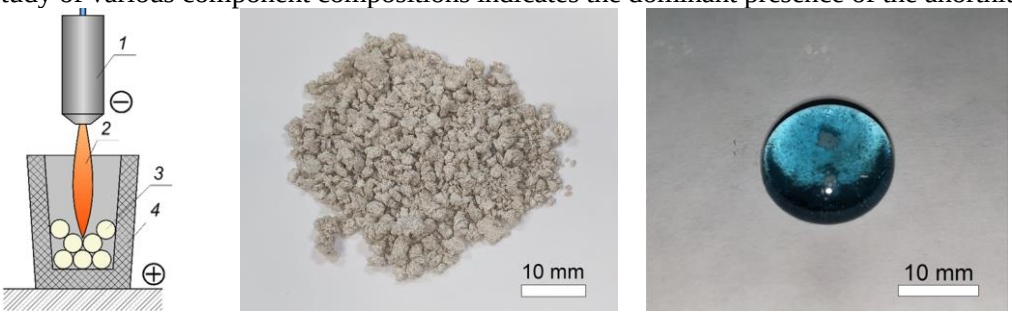
Anorthite ($CaAl_2Si_2O_8$) - is a mineral of the feldspar group, a member of the isomorphic series of albite-anorthite solid solutions called plagioclases. It has a framework-type crystal structure. The presence of anorthite in ceramics provides them with the necessary set of properties for use as wear-resistant, electrical and structural materials [1].

The processes of anorthite synthesis by the traditional method - sintering in high-temperature furnaces - are characterized by a long process, which entails significant energy consumption and low productivity. Despite these difficulties, the production of aluminosilicate ceramics for general purposes, including anorthite, does not lose its relevance. Currently, in the scientific community, in order to improve the synthesis process of aluminosilicate ceramics, they resort to the use of modern methods: hot pressing, reaction sintering, spark plasma sintering.

Another promising method for producing aluminosilicate ceramics is its plasma synthesis, which is characterized by rapidity and high energy efficiency [2]. The plasma melting process involves the action of a plasma flow on a raw material charge placed in a graphite crucible for a certain time. The temperature of the plasma flow can vary depending on the electrical parameters: current and voltage, as well as the flow rate of the plasma-forming gas.

The synthesis of anorthite is carried out at a certain ratio of the components CaO, Al_2O_3 and SiO_2 in the charge. One of the advantages of plasma synthesis technology is the expansion of the raw material base, since it does not require the use of high-purity raw materials [3].

In the work, a mixture of components was used as a raw material mixture: limestone (CaO), boehmite (Al_2O_3) and quartz sand (SiO_2) in various proportions, mixed with an aqueous solution of polyvinyl alcohol. As presented on fig. 1, *a*, method for the synthesis of anorthite consists of exposing a charge weighing 6 ± 2 g (fig. 2, *b*), placed in a graphite crucible, to a plasma flow for 30-60 seconds. The electrical characteristics of the plasma installation are voltage - 97 V; current strength - 100 A, plasma-forming gas flow rate - 10 l/min, type of plasma-forming gas - nitrogen. The melting product is a spherical glass-crystalline material (fig. 1, *c*). The X-ray phase study of various component compositions indicates the dominant presence of the anorthite phase.



a *b* *c*

Fig.1. Process of plasma sintering: a) – plasma installation scheme; b) – component charge; c) – melting product.
1 – plasmatron; 2 – plasma jet; 3 – component charge; 4 – graphite crucible

The results of the study of melting products indicate the possibility of synthesizing anorthite in a thermal plasma flow based on natural raw materials in the form of limestone, boehmite and quartz sand.

REFERENCES

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