NEW ELECTRIC ARC METHOD FOR SYNTHESIS OF MOLYBDENUM BORIDES*

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In recent times, there has been an increased demand for materials whose properties allow them to be used in aggressive environments. One of the candidates for the role of high-temperature material is molybdenum boride. This material has high hardness, resistance to high temperatures and excellent thermal conductivity. Molybdenum boride also has a high melting point and excellent resistance to oxidation and corrosion [1]. Compounds of the molybdenum-boride system have potential applications in structural applications requiring resistance to high temperatures [2]. There are several methods for the preparation of molybdenum boride. The most popular methods for synthesizing molybdenum boride are mechanochemical and self-propagating high temperature synthesis (SHS) [3].

Tomsk Polytechnic University is conducting research on obtaining materials in the molybdenum-boron system by a vacuum-free electric arc method. Nowadays the vacuum-free electric arc method is considered promising for the synthesis of various carbides and borides [4-5]. This novel method provides synthesis of materials in the plasma of electric arc in air atmosphere, which is possible due to the effect of self-shielding of the reaction zone, in which CO and CO_2 are released. Thus, there is no need to provide an inert environment for the synthesis process, unlike vacuum methods of product production.

As part of the research, the vacuum-free arc method and equipment for its implementation were modernized. Studies on the production of molybdenum borides under the influence of DC and AC arc discharge have been carried out. The synthesized materials were characterized by a number of analytical techniques, including X-ray diffractometry, scanning electron microscopy, transmission electron microscopy. As a result, the dependences of phase composition on synthesis conditions, namely, adjustable parameters of the arc reactor were determined.

The results of the conducted research serve as a scientific and technical basis for a new method and equipment for its realization for obtaining molybdenum borides, including higher molybdenum borides.

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