PECULIARITIES OF THE PLASMA PROCESS FOR PRODUCING TUNGSTEN CARBIDE USING AN AC PLASMA TORCH [[1]](#footnote-1)\*)

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The use of plasma-chemical method for the synthesis of carbide disperse materials [1, 2] provides a high rate of formation of the synthesized phase at a low growth rate. AC electric arc plasma torch allows to provide direct energy input and, accordingly, high temperature in the reaction zone, which determines the rapid course of chemical and phase transformations.

One of the advantages of the plasma process is the high heating rate of the plasma-forming gas and the processed material, as well as the possibility of achieving high values of the enthalpy of the arc plasma. The phase composition and morphology of the synthesized product depend on the electric parameters of the arc, the type and flow rate of the plasma-forming gas, the electrode material, and the geometry of the reaction chamber. Changing these parameters makes it possible to control the synthesis process and influence the particle size of the resulting material.

In this work, the experimental installation of plasma-chemical synthesis based on AC plasma torch with interchangeable electrodes (tungsten, graphite) was considered. The plasma-forming gas consisted of a mixture of hydrogen and methane in the ratio ~ 1:1, a mixture of tungsten oxide VI (WO3) mixed with technical carbon was placed in the reaction volume. According to experimental experience [3], the flow rate of plasma-forming gas was varied up to 0.5 g/s, the power of AC plasma torch was up to 5 kW at changing the average mass temperature of the plasma jet up to 2500 K.

The material obtained as a result of the experiments was examined with a scanning electron microscope Tescan Vega 3 SBH, X-ray phase analysis was carried out on an X-ray diffractometer Rigaku SmartLab 3. It was found that the samples contain tungsten carbide (WC) powder and graphite, and the amount of formed material is in direct relation to the time of the precursor in the high-temperature zone of the plasma-chemical reactor.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Lt/ru/EV-Dudnik.docx) [↑](#footnote-ref-1)