STUDY OF AC PLASMA TORCH FOR PRODUCTION OF HIGH-FINE REFRACTORY METAL POWDERS [[1]](#footnote-1)\*)

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A distinct advantage of plasma technologies 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 arc plasma enthalpy [1], which allows their efficient use in a number of technical industries. For example, in the field of new materials production. Applying of various plasma-forming gases and their mixtures in the plasma torches significantly increases the potential of the plasma-chemical installation. It should be noted that mixing of various gases in the AC plasma torch, considered in this work, is possible without stopping and readjustment it, which allows a wide range of experiments to be carried out without additional time and resources.

Thus, when hydrogen or methane is added to the plasma-forming gas (argon), the effective power of the plasma torch can be increased several times. This can be essential for reducing the processing time and decreasing the particle size dispersion of the resulting material.

The paper investigates an AC plasma torch design, its main operating parameters, dependencies and mutual influence. According to the experience of previous experiments [2, 3], successful production of highly dispersed refractory materials requires an AC plasma torch with power of about 5 kW, variation of the average mass temperature of the plasma jet within the range from 1200K to 2200K and working gas flow rate of up to 1 g/s. Changing the composition and using a mixture of various plasma-forming gases will allow maintaining optimal conditions and temperature conditions in the reaction zone for production of an ultrafine powder particles (including refractory powders) and adjusting the power level of the facility during the experiment.

The design of the experimental installation comprises an AC plasma torch, a precursor feed device (aqueous solution of metal salts, tungsten oxide powder, etc.), a reaction volume (plasma-chemical reactor), a separator, a hardening unit and a receiving container. In the reaction chamber, the heated plasma-forming gas (gas mixture) is mixed with the precursor, forming the target product, then it is separated, quenched and collected.

References

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