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INVESTIGATION OF THE METHANE DECOMPOSITION PROCESS IN AC ELECTRIC ARC PLASMA TORCH *)

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The urgency of issues of methane processing is due to the need to find efficient technologies of raw material processing and preparation for industrial implementation. The method of methane decomposition in an arc discharge at a temperature of about 2000 K is promising from the point of view of chemical transformations in this process, because as a result, hydrogen and carbon are formed.

Hydrogen can be further used, for example, as an environmentally friendly energy carrier or chemical raw material, and the carbon residue can be used as a stand-alone product for a large number of processes in many industries, including related to plasma production of materials [1, 2].

An experimental study of the methane decomposition process in an oxygen-free atmosphere in the AC electric arc plasma torch with power of ~ 5 kW was conducted. The experiments were carried out on an installation consisting of an AC plasma torch [3, 4], power source, sampling system, coolant and plasma-forming gases supply systems. The peculiarity of the experiment was the use of the ballast gas (argon) only to start the plasma torch, and a mixture of hydrogen and methane as the plasma-forming gas, its flow rate was up to 0.03 g/s.

The composition of the resulting gas was studied by mass spectrometry. The occurrence of a reverse flow in the cold non-reaction zone of the electric arc chamber of the plasma torch, which performs the function of a plasma-chemical reactor, has been established. Despite this, a significant part of the methane decomposed to form gaseous hydrogen. The degree of methane conversion was up to 89%.

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