FEATURES OF THE MORPHOLOGY OF THE MELT ON THE METAL SURFACE UNDER INFLUENCE OF PLASMA IN PLASMA FOCUS FACILITY [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2023.50.2023.1.1.181

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The aim of this work was to study the morphological changes that occur on the surface of metal targets located at different distances from the anode when exposed to plasma pulses in a Plasma Focus (PF) facility. Previously, it was noted that, when metal targets are exposed to plasma, the nature of destruction and the surface morphology strongly depend on the distance between the target and the anode of the facility. This created certain difficulties in selecting the optimal modes of operation of the PF setup at certain distances from the target to the anode. The experiments were performed on a PF-5 plasma focus setup (LPI). The energy reserve of the capacitive storage (20 μF) at a voltage of ~18 kV was ~3.2 kJ. The working gas was nitrogen at a pressure of ~1 Torr in the chamber. The anode with a diameter of Ø=30 mm and the cathode Ø=50 mm of the setup were made of copper. Targets ~90x90 mm in size and ~1 mm thick were made of AMg alloy, Cu, St3 steel, and H18N10T stainless steel. The number of plasma pulses affecting the target varied from one to several tens. It has been found that at a distance of ~25 mm from the anode, ring structures are formed on the surface of metals, the geometry of which corresponds to the dimensions of the anode and cathode. The most intense region of plasma action ~8-10 mm is located in the center of the anode region and practically coincides in size with the diameter of the cone hole in the anode. In this case, thin filaments of the melt are formed on the surface of targets made of St3 and stainless steel in a region of the order of the anode size. The filaments of molten metal are bent and twisted clockwise and counterclockwise relative to the center of the anode region. In the case of plasma action on targets made of AMg and Cu alloy, straight filaments of the melt are formed. The pattern of intersecting filaments of the melt is most clearly observed under repeated exposure to plasma pulses. It is assumed that the curvature of the melt threads is associated with the movement of the metal melt in a magnetic field. In this case, the currents flowing through the current-plasma sheath (CPS) located close to the metal target, as well as the currents flowing through the metal plasma jet flowing from the anode, play a significant role in this case. Plasma flows with right and left rotation were found in the photographs of plasma jets obtained using an electron-optical converter, which indirectly confirms the presence of the same magnetic fields. These considerations are also confirmed by the fact that on the targets made of diamagnetic Cu and in the paramagnet AMg no curvature of the melt lines is observed. With an increase in the distance from the targets to the anode of the setup of ~50 mm and more, the above-described patterns of the effect of plasma on metals are not observed. The area of ​​plasma impact is highly delocalized and a decrease in the intensity of the plasma flow is observed. The results of the experiments allow us to conclude that the location of metal targets at close distances from the anode has a significant effect on both the formation of current-plasma sheath and the morphology of the metal surface when exposed to plasma in PF-type facilities.

The work was carried out within the framework of state tasks: 075-00715-22-00 и 0023-2022-0004.

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