PLASMA FOCUS INSTALLATION WITH TITANIUM ANODE TIP [[1]](#footnote-1)\*)

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On the basis of the PF-5 installation of the Mather type with an anode assembly (anode and cathode) made of copper, modernization was carried out by replacing the copper tip of the anode with a titanium one. The aim of this work was to study the possibility of obtaining sufficiently chemically pure coatings and films of Ti and other metals on the surface of targets made of various materials. The setup had the following parameters: stored energy 3.2 kJ at operating voltage up to +18 kV; the capacitance of the capacitor bank is 20 uF (4 capacitors of 5 uF each). The discharge chamber was made of an alloy of the AMg type and had the following dimensions: an inner diameter of 180 and a height of 146 mm. The working gases were: deuterium and noble gases. The anode and cathode diameters were 30 and 51 mm, respectively. The anode length was 43 mm. The time intervals between plasma pulses were ~3 min. It is known that when various types of coatings and films are obtained on plasma focus devices, they contain impurities associated with the sputtering of the anode material (Cu). At the same time, when solving a number of applied problems, it is necessary to obtain coatings and films of sufficiently pure chemical composition. It is believed that the manufacture of the anode unit from another material with a lower electrical conductivity can lead to unstable operation of the installation and will not allow one to obtain its characteristic current convergence in the form of a funnel (current-plasma shell) and maintain a high energy density in the plasma pinch.

The paper presents the first experimental results of studying the operating parameters of the PF-5 installation with a titanium anode (while maintaining the copper cathode) and another option is to replace only the copper tip of the anode in the anode unit from Cu with a titanium one. In the first case, the anode body was made of H18N10T steel and covered with a Ti film ~0.4 mm thick. The anode tip was made of VT1-0 titanium and installed instead of copper. It turned out that in this case the operating mode of the installation changed significantly, the "singularity" was small and was observed only in the region of maximum amplitude of the derivative of the discharge current. In this case, the intensity of the plasma flow was also low. In the second case, when only the copper tip of the anode was replaced with a titanium one, an increase in the amplitude of the “singularity” and a significant increase in the energy in the plasma pulse were observed. Photographs of the plasma jet were obtained using an electron-optical converter. It has been established that the nature of the formation of the plasma flow is in many respects similar to that observed on the anode assembly made of copper. The first experiments on the effect of cumulative Ti plasma flows on metal targets and silicate glass have been carried out. The results obtained allow us to conclude that plasma focus devices with energy of several kilojoules can be used to obtain intense plasma flows from various metals by appropriately replacing the anode tip. At the same time, a sufficiently high chemical purity of the coatings, which is necessary for solving a number of applied problems, is also achieved.

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