

USE OF MAGNETRON DEVICES IN A PACKAGE PLASMA IMMERSION TECHNOLOGY OF SURFACE TREATMENT

*Institute of Technical Mechanics
of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine,
15 Leshko-Popel St., Dnipro 49005, Ukraine; e-mail: Gryshkevych.O.D@nas.gov.ua*

The aim of this work is to study the possibility of using a plasma immersion technology in the local strengthening treatment of the outer friction surfaces of properly sized tubular parts and the group strengthening treatment of sculpture parts whose outer surface has a developed geometry. Consideration is given to a package technology that includes a high-intensity low-energy nitrogen implantation and the deposition of a nanostructure functional coating.

The features of using an accelerated gas ion source in the package technology of friction pair working surface treatment were studied. The package technology includes ion polishing, which eliminates the consequences of abrasive treatment. For titanium alloy parts, the features of surface pretreatment prior to coating deposition in the case of "oil" pumping were revealed. For the treatment to be of an immersion character, a novel method was used for the connection of a power source for the ion accelerator discharge.

It was shown by experiment that an unbalanced planar magnetron device can generate a plasma beam for the preparation operations of heating, cleaning, and activation of the surface of the part under treatment. With its help, a functional coating is deposited, and a working plasma environment is produced for the local and group immersion technology of high-intensity nitrogen implantation.

The use of magnetron-type plasma devices, which allow plasma immersion treatment in a rarefied non-self-maintained glow discharge plasma, was substantiated. A magnetron device for coating deposition at a reduced pressure of 7×10^{-4} to 8×10^{-4} Torr was developed and tested. Due to the magnetic system of the magnetron being highly unbalanced, a plasma beam is formed, which is used in local plasma immersion treatment and in a gas-discharge electron source for initializing a non-self-maintained glow discharge. An integrated plasma device, which includes an unbalanced planar magnetron and an electrode system for a wide-aperture plasma electron source, was developed.

Prototype samples treated by the plasma immersion technology were prepared. The results obtained are in agreement with the expected ones.

Keywords: *plasma immersion technology, ion plasma technology, ion beam technology, high-intensity low-energy ion implantation, non-self-maintained glow discharge, unbalanced planar magnetron sputtering system, ion source with closed electron drift, wide-aperture electron source, hollow cathode.*

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