MODELLING OF THE DIFFUSION SATURATION OF METALS AND ALLOYS IN THE GLOW DISCHARGE PLASMA INSIDE A HOLLOW CATHODE

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The generation of low-temperature glow discharge plasma forms the basis of vacuum plasma technology that used for surface modification. In the hollow cathode with low-pressure nitrogen, the ion current density is required to keep of approximately 1mA/cm^2 on the treated target surface and the operating discharge voltage is prescribed of hundreds volt. The external injection of electrons provides a possible control of the discharge current and voltage whatever the used gas kind and it pressure. After 1–2 hours of nitriding in nitrogen inside the cathode, the microhardness on surface and by depth of steel increases more than 3 times.

The main parameters of plasma treatment include the gas composition or gas mixture ratio, temperature and time of the process, operating pressure, discharge parameters, the degree of the working gas dissociation and ionization, ion energy and ion current density on the treated target surface. It is important to control process of layer modification, reaching the specified behaviors of material.

This work models the processes of plasma generation in hollow cathode and metal diffusion saturation by nitrogen atoms in the plasma of a low-pressure non-self-sustained glow discharge. The model includes the mechanism of low-pressure glow discharge generation in the hollow cathode, the mechanism of mass transfer and the task corresponding information.

Mathematical model allows linking the technological parameters with the structure modified layer that is formed by the nitriding of metals and alloys.

Model results stay in an agreement with the experimental data and investigations of other researchers.

Keywords: *diffusion saturation of metal, glow discharge, hollow cathode, plasma, nitriding.*