EFFECT OF EXTERNAL MAGNETIC FIELD SUPPLY ON MICRO-PLASMA ELECTROCHEMICAL PROCESSES

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In the modern technological structure, the technology of microplasma ceramic-like coating formation is one of the most promising. This situation is associated with great demand for the practice of such coatings: space, military, automotive production, mining, etc. Compared to others, ceramic-like coatings possess a number of unique physicochemical and mechanical properties (wear resistance, corrosion and erosion resistance, heat resistance, etc.), which make them indispensable in many issues of practice. However, despite more than half a century experience of using microplasma electrochemical coatings, there is no information about the effect of the application of an external magnetic field H on the parameters of the coating process and the properties of the resulting products. Microplasma electro-chemical processes (MPP) is a complex of coupled chemical, electrochemical, plasma-chemical reactions that take place at high polarizations in the macrosystem of silicate alkaline electrolyte - metal oxide - metal and accompanied electrical micro-discharges. The result of these reactions on the surface of metals are ceramic-like composite layers. According to modern concepts, the formation of ceramic-like composite coatings occurs due to the oxidation process of a metal substrate and deposition processes of oxides and minerals from electrolyte.

At present, there are no reports on the effect of H superposition on the ion current in MPP processes. It is a priori clear that when a constant external magnetic field H is applied, according to the Ampere law, the direction of the current (the direction of movement of the ions) will change. Accordingly, this change may affect the effectiveness of the coating formation, since the current density near the surface to be coated should change when H is applied.

In this paper, we present the results of preliminary experiments on the effect of H superposition on the thickness of the coating, which is obtained in the macrosystem of silicate alkaline electrolyte - metal oxide – aluminum. For the first time it was found that the imposition of H up to 50% increases the coating thickness (Al_2O_3 + aluminosilicates). This effect occurs when H > 1000 Oe. Interpretation of the results obtained is carried out within the framework of the model of the influence of H on ion-diffusion processes in the reaction layer.