P-21 Obtaining surfaces with taylor cone shaped asperities of micro- and nano-scale dimensions using the edi method

Pavel TOPALA[1], Vitalie BEŞLIU[1], Vladislav RUSNAC[1], Dorin GUZGAN[1], Irina PLEŞCO[1]
[1], *Alecu Russo Balti State University, Bălți, Republica Moldova*

The present paper is devoted to experimental investigations concerning the treatment of conductive surfaces by applying electric discharges in impulse (EDI). We have particularly focused on the modifications of metal surface micro-geometry leading to the formation of Taylor cone shaped asperities. We have established and presented the best energetic regimes of extracting the latter from cylindrical and flat pieces made of W+10%Re using EDI. The modern stage of scientific and technical progress is characterized by a transit from macro- to micro- and nano-organization of matter. Having studied the samples of the surfaces treated via the method of EDI using the method of optic microscopy with the optical microscope XIM600 and the SEM with electronic microscopes Vega TESCAN 5130 and QUANTA 200 (FEI Fillips), we can observe that Taylor cones are formed not only in the centre of the crater but also at its peripheries due to the development of electro-hydrodynamic instability on the melted tungsten surface as a reaction of the plasma channels and the substance interaction (Fig.1). Varying the interstice size, it is possible to obtain almost any degree of intensification of the working surfaces with the emission of energy on the surfaces subjected to treatment or in the interstice. Increasing the interstice size, we may obtain such states when the heating of the volume of the treated material is not essential and the geometry of the sample surfaces does not change. This possibility may be applied in the development of new surface treating technologies by applying electric discharges in impulse.

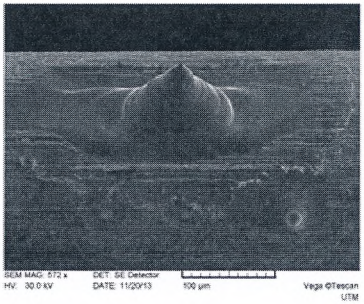

Fig. 1 Scanning electron microscope (SEM) image of a conic asperity surrounded by smaller ones, extracted on the surface of the piece material at a solitary discharge

Conclusions - The extraction of conic asperities in the process of treatment with EDI is more favorable if the piece is connected as anode. However the successful extraction of asperities from the cathode in conformity with the theory of developing capillary waves is not excluded; - The use of the EDI method to modify the micro-geometry of metal surfaces permits the increase of its active area by several times.