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The field of composite materials represents a considerable source of possibilities for searching erosion resistant electrodes. The experiments have shown that erosion resistance of composite material electrodes depends upon a chain length of refractory component sintered particles 1 that is, the longer these chains are, the more erosion resistant the material is. It is indicative of perspective application of composite materials with fibrous structure, that is, reinforced materials. Special investigation of integral erosion effect at discharge on the boundary line between two metals have first been presented in 2 . It has been shown that in this case asymmetrical erosion traces form and the processes have been interpreted from the electrical erosion migration theory point of view. Up till now the dynamics of the electrode processes on reinforced materials has not been investigated

The electrode processes on reinforced materials: W-Ag, W-Cu, Fe-Al at discharges with square current pulse of 180 μs and current amplitude of 450-1720 A have been studied by high-speed photorecording. The experiments have been carried out in air at the atmospheric pressure.

Erosion traces at unit discharge on reinforced materials in cathode and anode regimes are characterized by the presence of zones with continuous failure of wires and bonds as well as the ones with failure of wires only along the perimeter. With high density of wires the bond pressed out in the form of lugs is observed (Fig. 1a,b).

From these photograms it follows that electrode processes are of a discrete type in space and time which is revealed in appearance and existence of separate spots providing current flow through the boundary between metal and plasma. In this case the spots on reinforced materials are of the same form as on homogeneous materials. However, their distribution due to macroinhomogeneity of reinforced materials has a number of peculiarities. As a whole discharge development

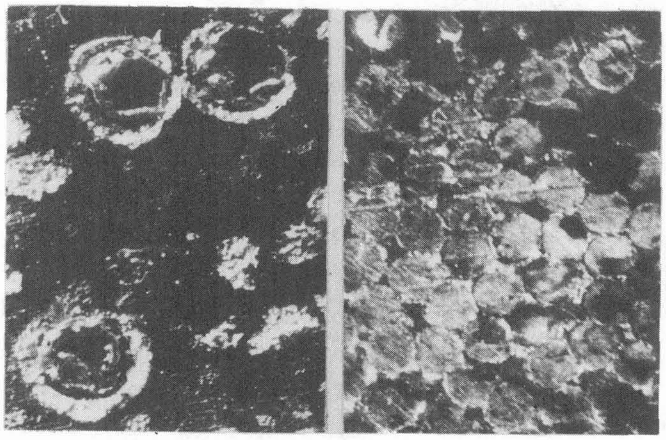

Fig. 1. Erosion trace on a reinforced electrode in the cathode regime A) Al-Fe; b) W-Ag

occurs during several stages, their duration depending on the material composition 3 . Thus in the case of a reinforced material Fe-Al the primary period of the discharge in the cathode regime is characterized by the development of weak luminescent mobile spots. The intense uniform luminescence of wires begins from about the 30th μs and from the 70th μs bright, less mobile spots appear. They develop along the perimeters of the wires gradually covering all the area with further transition to the Al-bond. The regions of bright luminescent spots form a bright cloud in the centre of the discharge, its area coinciding in dimensions with the fused zone of the erosion trace. In the case of the materials W-Cu and W-Ag the process of discharge development is characterized by uniform luminescence of wires up to 20-30 µs followed by the appearance of bright luminescent spots along the perimeters of the wires which gradually cover all the area of the wires with further transition to the bond.

Irrespective of the polarity of electrodes and alongside with the selectivity of spot appearance some delay in appearing bright luminescent spots is observed in comparison with the case of homogeneous materials. The process of discharge fading is characterized by fading firstly bright luminescent spots on the bond and in the centre of the wires. The spots on the wire periphery are the last to disappear.

The reinforced materials are characterized by a big length and random direction of boundary lines between metals with different physical properties. This influences the distribution of spots 4 in a complicated way. The refractory wires act as kerns stabilizing spots as it happens in the case of Hg-discharge.

Such a distribution of spots substantially influences the development of thermophysical processes which results in a number of peculiarities of the erosion effect. The primary peculiarity consists in the main heat load being performed by the refractory wires of the wire fitting and a more fusible component performs the function of a cooling agent. The fusible component contribution to the erosion process is determined in general by the vaporous phase because its melt is kept from throwing out by the capillary forces.

Hence it follows that the bond must possess good electrical and heat conductivity, a considerable wetting as far as the wire material is concerned. The boiling point is to be somewhat lower and comparable with the melting temperature of the wires. The vapor pressure must be somewhat larger than that of the wire material This will condition discharge burning on the wires with smaller density of the current than in the vapor of the wire material.

It is also important that wire sizes should be comparable with the ones of heat interaction zone of metals. This will provide the largest levelling of the heat load on the surface of the reinforced material. The delay in appearance of bright spots making the main contribution to the erosion is determined by the cooling effect of the bond. The whole complex of the above conditions provides a considerable increase of the erosion resistance of reinforced material electrodes in comparison with the ones of homogeneous materials.

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