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Advantages and Disadvantages of Using the Method ESA

The development of modern engineering is not possible without the use of modern technologies to improve their strength surface details. Currently, the most interesting are electrical methods of application and hardening coatings on metal surfaces using the concentrated streams of energy (laser, electron, plasma, etc.). These methods include electrospark alloying (ESA) - the technology of coatings by electrical discharge machines, ie interaction between the anode (treating electrode) and the cathode (the part). Advantages of the method ESA is the possibility of putting on the work surface compact electrode conductive materials, high adhesion layer applied to the base material, low power process, ease of implementation of operations, improved mechanical and chemical properties of construction materials by applying to the surface of alloys with special properties. Along with these advantages this method has a number of drawbacks that hinder its widespread industrial application. The main disadvantages are the small thickness of the layers, the lack of sufficient information about the patterns of structure formation of the materials to be affected by the electric spark.

As a result, ESA is formed on the electrode surface secondary structure, which differs from the original, consisting of a zone located below the fusion and heat affected zones. Zone melting, which has been established by quenching from the liquid state, is characterized by a small size of the structural components. With most metals and alloys the melting zone is formed by the "white coat", which has high hardness and resistance against the effects of acids. Many issues related to the formation of structures and special properties of the "white layer", obtained by the ESA are not well understood. Investigation of pattern layer by ESA and the development of technologies for ESA by coating with desired properties on the parts are of great scientific and practical interest and relevance to the problem of mechanical engineering. To address these problems the following objectives are needed to be considered: investigation of the laws of formation of the surface layer at ESA electrode materials of copper and its alloys, depending on the composition of the original structure, heating or cooling mode cathodes and change the settings for the ESA; establishment of the laws of structure of the surface layer when used as electrode materials-iron alloys, depending on the carbon content of the environment and the parameters of the installation; the study of the effect of heating the cathode and the final heat treatment of the layer obtained by ESA steel electrodes, an increase of structural uniformity and fewer fractures. Thus, the study addresses the important issue, namely the establishment of the laws of formation of the structure and properties of the layers on metal parts under the influence of low-voltage electric-process in order to control their functional properties.