Peculiarities of plasma-electrolyte treatment of multicomponent alloys with the formation of heterooxide nanocomposites

Karakurkchi H.V.*[1], Sakhnenko M.D.[2], Korogodskaya A.M.[2], Yermolenko I. Yu.[2], Stepanova I.I.[2], Yar-Mukhamedova G.Sh.[3]

[1] National Defence University of Ukraine named after Ivan Cherniakhovskyi, Povitroflotskyi Ave. 28, Kyiv-03049, Ukraine.
E-mail: anyutikukr@gmail.com

[2] National Technical University "Kharkiv Polytechnic Institute", Kyrpychova Str. 2, Kharkiv-61002, Ukraine.

[3] Institute of Experimental and Theoretical Physics, Al-Farabi Kazakh National University, 050040, Al-Farabi av., 71, Almaty, Kazakhstan.

Alloys of valve metals are widely used as carriers of catalytic systems. But plasma-electrolyte treatment of such materials is complicated by the heteroresistivity of the surface of Al and Ti multicomponent alloys. So, establishing the features and developing the optimal method of PEO surface treatment of such materials is an important practical task. Alloys AK12M2MgN and OT4-1 were the model objects for experimental studies. It was established that varying the composition of the working electrolytes, PEO regimes, and adding dopant metals (Co, Mn, Zn, Mo, W) provide flexible control of the characteristics and properties of the formed heterooxide nanocomposites. We have established approaches for controlling PEO treatment of multicomponent Al (Ti) alloys. It is shown that the ratio of electrolyte components (c, mol/dm^3), PEO current density (j, A/dm^2), sparking and formation voltage (U_s, U_f, V), PEO time (t, min) are factors of the variability of plasma-electrolyte treatment of alloying alloys [1]. Changing these parameters allows to change the qualitative and quantitative parameters of the modified surface, as well as to determine the complex of functional properties of the synthesized coating. The practical significance of the obtained results is the developed variable technological schemes of plasma-electrolyte treatment of multicomponent aluminum (titanium) alloys in diphosphate electrolytes with minimization of alloying elements in the surface layers and the formation of heterooxide coatings with an increased content of active components and specified functional properties.

1. Karakurkchi A.V., Sakhnenko N.D., Ved' M.V., Luhovskyi I.S., Drobakha H.A., Mayba M.V. Features of plasma electrolytic formation of manganese- and cobalt-containing composites on aluminum alloys. Advances in Materials Science and Engineering. 2019. Vol. 2019. Article ID 6381291, 13 p.