Study of Morphology and Microhardness of Co-Mo Alloys Films

Shtefan V.V., Yepifanova A.S., Berezovskyi I.S., Shkolnikova T.V.

National technical university „Kharkiv politechnical institute“, Kharkiv, Ukraine

Galvanic alloys of Co-Mo are one of the most perspective materials used in microelectronics and technology of microelectromechanics devices [1]. Depending on correlation of components the property of such alloys can largely change: alloys with high maintenance of cobalt show magnetic properties and can be used in the devices of record and maintenance of information, alloys with high maintenance of molybdenum possess high hardness.

Films of alloy Co-Mo, getting with galvanic method were viewed in this study. The content of the refractory component varied 0 ... 85 wt.%. Structure study was conducted using a Leica DM ILM metallographic microscope with a digital camera Leica DFC 295 maintaining the appropriate hardware and software [2]. Vicker's microhardness (Hv) coatings cobalt-molybdenum alloy was determined by pressing a diamond pyramid hardness tester PMT - 3 by the load of P = 0,2 kg and 10 seconds time delay. Hv calculations were calculated using the method [3]. Impedance calculations were performed using the system IPC-Pro and FRA in acidic and neutral aqueous areas, the parameters of the impedance were determined by the technique [3].

Impedance spectra indicate that the equivalent scheme of the electrode-electrolyte were described by the model Eshlera-Rendolsa. The definition of transfer resistance were the maximum and the capacity of the electric double layer - the minimum for films consisted on alloys with a molybdenum content greater than 25 wt.% was defined. The behavior of the spectra and the parameter's definition of impedance indicates about the formation on surface of films compounds of a new phase.

Entering of molybdenum compounds in the electrolyte increases the hardness of the coating, the highest scratch microhardness reaches 429 kg/mm^2 for films with molybdenum content of 50 wt.%. Further increase of the molybdenum content to 85 wt.% In the alloy leads to a reduction of microhardness definition was equal to 313 kg/mm^2.

1. Shtefan V.V., UA Patent112925, 2016.
2. Shtefan V.V., Bairachnyi B.I., Lisachuk G.V., Smyrnova O.Yu., Zuyok V.A., Rud R.O., Voronina O.V. Corrosion of Aluminum in Contact with Oxidized Titanium and Zirconium // Materials Science, 2016, Volume 51, Issue 5, p.p. 711–718.
3. Shtefan V.V., Ved M.V., Sakhnenko M.D., Pomoshnyk L.V., Fomina L.P. Regularities of the deposition of cobalt-tungsten alloys by pulsed currents // Materials Science, 2007, Volume 43, Issue 3, pp 429–433.