Nanostructured surfaces

Electrodeposition of Pd-Au nanoparticles in DMSO solution

O.Ya Dobrovetsksa[1], O.I. Kuntyi[1,2]

[1] *Lviv Polytechnic National University, Bandera Street, 12, Lviv-79013, Ukraine. E-mail: oksana_dobrovetska@mail.ru*

[2] *Army Academy named after Hetman Petro Sahaidachny, Gwardiyska Street, 32, Lviv-79012, Ukraine*

The aim of the study was to illustrate the possibilities of pulse current protection and organic aprotic solvent for precipitating nanosized bimetallic particles on the example of the system Pd-Au. It is a continuation of systematic studies of electrochemistry nanoparticles of metals in non-aqueous media [1].

The deposition is made by us on the surface of glassy carbon in dimethylsulfoxide solutions in pulsed regime of electrolysis. The influence of concentration $PdCl_2$ and $HAuCl_4$ and the values of cathodic potential on the morphology of deposition, sizes of particles and composition of the bimetallic system are studied.

It is shown, that palladium and gold co-deposit with the formation of the system of Pd-Au when E = -0.3 ...-1.5V, in solutions of 0.004M $PdCl_2$ (0.002 ... 0.004)M $HAuCl_4$ in pulsed electrolysis regime. It is determined that the tendency to decrease of the sizes of the deposited nanoparticles is observed with increasing cathodic potential values from -1 to-1.5V. Cathode deposit is discrete sphere-like particles, which are uniformly distributed over the surface of glassy carbon (figure).

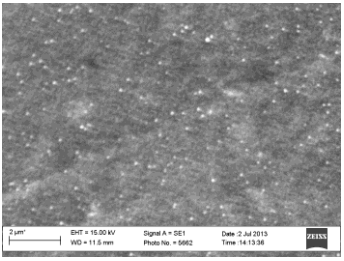

Figure. SEM images of the surface of the glassy carbon with deposit of Pd-Au, obtained in DMSO solution 0.004M $PdCl_2$ + 0.002M $HAuCl_4$ + 0.05M Bu_4NClO_4, E = -0.75V, t = 35 °C, τ_{on}: τ_{off} = 6:300 ms

The cathode potential value is an effective factor of influence on the content and sizes of bimetallic particles in pulse regime of electrolysis.

1. *Kuntyi O., Saldan I., Bilan' O., Okhremchuk Y., Hapke J.* Metal content and morphology of nanostructured Ag–Pd co-deposits // Materials Letters. – 2012. – V. **69**. – P.79–81.