Nanostructured surfaces

Pulse electrodeposition of gold nanoparticles in dimethylformamide solution of $H[AuCl_4]$

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Gold nanoparticles have received great interests due to their attractive physical, physical-chemical as well as catalytic properties and possibility of wide applications in different fields of science [1-2].

Gold deposition by pulse regime electrolysis onto glassy carbon from dimethylformamide (DMF) solutions of 0.002…0.008M $H[AuCl_4]$ + 0.05M Bu_4NClO_4 was studied.

Because of pulse potentiostatic method including voltage region of (-0.1… -1.6 V), pulse time (τ_{on}) of 6 ms and pause (τ_{off}) of 300 ms the deposits were found as nanostructured gold.

It has been shown that in the range cathode potentials E = -0.1…-1.4 V nanoclusters and particles with the size from tens to hundreds of nanometers are formed. It has been established that the main factors which influence on geometry of particles and morphology of deposit are cathode potential (current density), and duration of electrodeposition. At E = -0.3…-0.6 V 100…400 nm size urchin-like shape nanoclusters and at E = -0.8…-1.4 V 70…300 nm size spherical particles of gold are formed.

Increasing electrodeposition duration or number of pulse cycles, observed kinetics confirms a logical change in direction of nucleation→growth→coalescence. During the electrodeposition the tendency to dominant of metal particles growth compared to nucleation take place, which promotes the formation of the film.

1. *Guo Sh., Wang E.* Synthesis and electrochemical applications of gold nanoparticles // Anal Chim Acta.-2007.-**598**, N 2.-P. 181-192.
2. *Daniel M.-Ch., Astruc D.* Gold Nanoparticles: Assembly, Supramolecular Chemistry, Quantum-Size-Related Properties, and Applications toward Biology, Catalysis, and Nanotechnology // Chem Rev.-2004.-**104**, N 1.-P. 239-346.