Nanooptics and nanophotonics

An influence of light irradiation to corrosion of nanoscale copper films

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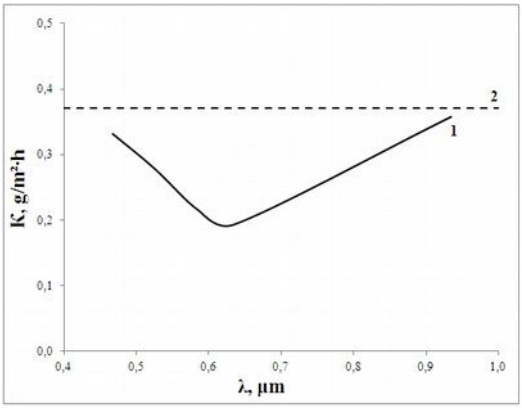
This work is a continuation of research cycle [1, 2], devoted to corrosion firmness of thin copper films, using as current conductors at most of mobile computer devices. It was considered an influence of optic characteristics of metal, aggressive solution and irradiation light to corrosion process of nanoscale copper films.

It was shown, that at the irradiation of monochromatic light in spectral area λ=(0,4 – 1,0)μm, a corrosion speed K of nanoscale (80 nm) polycrystalline copper films in water solution of HCl ($3{,}25 \cdot 10^{-3}$ mole/l, 25°C) is less (curve 1) than at the absence of irradiation (straight 2).



The speed lowering is caused by action of electromagnetic ware to electrons, which take part in corrosion. Them oscillation presents to realization of this electrochemical process.

At the area of a visible light (0,4 – 0,7) μm, where copper reflectance is rised [3], that is free electrons oscillations at this metal becomed stronger, an additional lowering of K is observed. At the infrared area (0,8 – 1,0) μm, where an absorption band 0,92 μm of water molecules is placed [3] and a headting of HCl solution is carried out, on the contrary, the increasing of K is observed.

At the irradiation by polychromatic light from incandescent lamp the size of illumination at range (0 – 1000) lx is feebly influenced to corrosion speed. In this case a corrosion braking by visible light is compensated of it's acceleration due to solution heating at an absorption of infrared radiation.

1. *Andreeva A.F., Kasumov A.M., Karavaeva V.M., Sorbat A.I., Vlasenko N.A., Uvarova I.V.,* Corrosion of thin copper films at coast atmosphere and water of Black Sea // I. Nanostructurnoe materialovedenie.-2013. N 3-4. -P. 28-33.

2. *Andreeva A.F., Kasumov A.M., Potipaka E.A., Musiychuk A.V., Vlasenko N.A., Karavaeva V.M.,* An influence of alternating electric field and ultrasound to corrosion of nanoscale copper films // I. Nanostructurnoe materialovedenie.-2014. N 9/10. -P. 143-147.

3. *Kozelkin V.V., Usoltsev I.F.* Basics of infrared technigues // -1974. -M. -Mashinostroenie.-P. 335.