Thematic Section: Research into New Technologies. **Full Paper**
Subsection: Materials Science. *Reference Object Identifier* – ROI: jbc-02/18-53-3-67
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
The article is published based on the materials of the 2nd stage of *the Mini-Symposium "Butlerov's Heritage –17-18"*
(Kazan).Submitted on January 19, 2018.

The formation of a dry layer of a photosensitive composition on the surface of the dielectric

© **Ludmila A. Brusnitsina**,[1,2]*+ **Tatiana A. Alekseeva**,[1] and **Elena I. Stepanovskih**[1]
[1] *Physical Chemistry and Chemistry of Colloids Academic Department. Ural Federal University Named after the First President of Russia B.N. Yeltsin. Mira St., 19. Yekaterinburg, 620002. Russia. E-mail: brusnitsyna.l@yandex.ru*
[2] *Ural Institute of the State Fire Service of the Ministry of Emergency Measures of Russia. Mira St., 22. Yekaterinburg, 620062. Russia.*

*Supervising author; +Corresponding author

Keywords: the formation of the photosensitive layer, crystallization, non-equilibrium and equilibrium drying of the layer.

Abstract

Photo-selective activation of dielectric materials is widely used in the production technology of printed circuit boards additive method. Photoaddition technology is a complex multistage process. The process of formation of the photosensitive layer on the surface of the dielectric material using compositions based on cupric acetate and sodium salts of anthracenesulfonic is investigated. The aggregate state of substances plays a very important role in the processes occurring under the influence of radiation.

The aim of the research was to study the features of the formation of the dry layer of the photo-composition on the surface of the dielectric material and to determine the effect of the structure obtained by drying the layer on the quality of the copper coating. This is the end result of the entire photoactivation process.

Primary processes under the influence of radiation in most solids are very specific and qualitatively different from the corresponding processes in liquids and gases. The studied process of photoactivation of dielectric materials is also a process in the solid phase, the regularities of which will depend on the structure of the photo-composition layer formed on the dielectric surface.

The rate of evaporation of the solvent depends on the drying conditions. The rate of evaporation of the solvent is very low under equilibrium drying conditions. Thanks to this, a well-formed crystalline layer is formed on the surface. In real conditions, it is quite difficult to achieve simultaneous crystallization of all components. The selection of components will be divided in time. It is possible to achieve simultaneous crystallization of all components only in conditions of nonequilibrium drying.

The processes of crystallization of individual components of light-sensitive solution under equilibrium conditions are studied. It is found that as a result of drying, close to equilibrium conditions, individual components of the photo composition crystals of different shapes are formed, due to the nature of each component.

You cannot specify a high concentration of components when carrying out drying in the equilibrium conditions for obtaining fine crystals. Drying should be carried out in non-equilibrium conditions at high speed at high concentrations of components in the solution. This can be achieved by varying the temperature and pressure in several ways: increasing the drying temperature to values below the dark reaction temperatures; lowering the pressure; increasing the drying temperature while lowering the pressure; instantaneous freezing of the photo composition at 77 K with subsequent drying in vacuum.

Intermolecular interaction between alcohol molecules and other components occurs when ethyl alcohol is injected into the photosensitive composition. This leads to homogenization of the dry layer of the photo composition.

The process of formation of the photosensitive layer on the surface of the dielectric material using compositions based on cupric acetate and sodium salts of anthracenesulfonic is investigated. It is shown that the structure of the dry photosensitive is determined by the concentration of the components of the photosensitive layer, the nature of each component and the drying conditions. It is established that the obtaining of a homogeneous photosensitive layer during drying under non-equilibrium conditions.

References

[1] W. Backenbaugh, D. Dinella, T.A. Polakowski. A new process for patterning prinked wiring boards. *Electronic packaging and production*. **1981**. No.12. P.76-90.
[2] L.A. Brusnitsina, E.I. Stepanovskih, T.A. Alekseeva, and V.I. Dvoinin. Photoreduction process modeling of copper(II) in the solid phase. *Butlerov Communications*. **2012**. Vol.29. No.1. P.75-79. ROI: jbc-02/12-29-1-75
[3] L.A. Brusnitsina, E.I. Stepanovskih, T.A. Alekseeva, A.O. Osipchuk, and B.V. Budanov. Quantum-chemical modeling of photoreduction of copper acetate. *Butlerov Communications*. **2016**. Vol.46. No.5. P.95-103. ROI: jbc-02/16-46-5-95
[4] V.V. Sviridov. Photochemistry and radiation chemistry of inorganic substances. *Minsk: Higher school.* **1964**. 389p.
[5] P.V. Myklyar. Physical processes in the formation of a hidden photographic image. *Moscow: Science.* **1972**. 399p. (russian)
[6] M.P. Shaskolskaya. Crystallography. *Moscow: Higher school.* **1976**. 390p. (russian)
[7] G.G. Lemlein, A.A. Chernov. Elementary processes of crystal growth. *Moscow: I.L.* **1959**. 300p. (russian)
[8] G. Genish. Growing crystals in gels. *Moscow: World.* **1973**. 112p. (russian)
[9] A.V. Shubnikov, V.F. Parvov. Nucleation and growth of crystals. *Moscow: Science.***1969**. 70p. (russian)