

STUDY OF NOVEL EPOXY COMPOSITIONS WITH SILVER NANOPARTICLES BY DIFFERENTIAL SCANNING CALORIMETRY AND REFRACTOMETRY¹

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Metal-polymer nanocomposites (and specifically containing silver nanoparticles) have unique optical, thermophysical and bactericidal properties, that is why their development and study are of current interest. One of the interesting types of such materials is nanocomposites formed by curing epoxy resins (ER) containing nanoparticles precursor (salt). An important condition of such nanocomposite formation is the salt dissolving in the oligomeric matrix. Therefore, the goal of the research is to study silver reduction from its precursor (nitrate) in epoxy matrices.

The main objects of the study were epoxy resin Epikote 828 with $M_n=375$ (Hexion, USA) and polyglycidyl ether of oligoxypropylene triol Laproxide 703 with $M_n=732$ and $f_{EP}=2.43$ (Macromer, Russia). The metal precursor was silver nitrate (Merck, Germany). The studies were carried out by differential scanning calorimeter DSC Q-100 (TA Instruments, USA) in the range 188-473K in an argon atmosphere at the heating rate of 10 K/min. Refractive index was detected by URL-1 instrument at 22 °C by standard techniques.

Experimental results indicate that the rate of silver ions reduction is influenced by the salt dissolution rate and the silver nitrate solvation possibility in the epoxy resin. Influence of ER chemical nature on Ag⁺ reduction in the epoxy matrix is demonstrated. Our results allow to optimize the synthesis of silver nanoparticles in ER stable dispersions. On the basis of the dispersions it is planned to develop epoxyamine nanocomposites with improved optical and other properties.

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