

Nanochemistry and Nanobiotechnology

Synthesis of mesomorphic glassy composites based on cobalt and cadmium caprylates with Au-Ag bimetallic nanoparticles

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Composites with gold and silver metallic nanoparticles are attracted the attention of researchers because of their unique optical and nonlinear optical properties are superior in comparison with their monometallic counterparts. The Au-Ag alloy nanoparticles exhibit interesting electronic and structural properties and can be used in nanoelectronic devices for optical marking, in particular for addressing different optical channels in the visible region of the spectrum [1]. The position of plasmonic resonance absorption band may be shifted when changing the silver/gold quantitative ratio in binary metal nanoparticles.

In this report, the nanocomposites with the Au-Ag binary nanoparticles have been prepared in the liquid-crystalline melts of cadmium and cobalt caprylates respectively by alloying previously prepared nanocomposites with monometallic nanoparticles at a temperature of cadmium and cobalt caprylates mesophases existence (98-165°C). Mesomorphic glasses with binary nanoparticles were obtained by rapidly cooling of these melts. The influence of the nature of the metal-alkanoate matrix and gold-silver nanoparticles ratio on the shift of the plasmonic absorption band have been studied. The ratio Ag/Au was varied in the range $x\text{Ag} + (4-x)\text{Au}$, where $x = 1, 2, 3$ mol%.

The obtained samples were studied by UV-Vis spectroscopy and transmission electron microscopy (TEM). Analysis of the plasmonic resonance absorption bands evidences about the formation of bimetallic alloys of gold and silver with a mean size to the range of 15-30 nm.

Thus, the liquid crystals of cadmium and cobalt caprylates may be used as “nanoreactors” for synthesis of the Au-Ag alloy nanoparticles what opens up a simple and effective way to create plasmonic nanomaterials. In addition, the overlap of the absorption bands of binary nanoparticle and the cobalt caprylate matrix may be interesting to examine the impact of such kind overlap onto nonlinear optical responses obtained nanocomposites.

1. *Knauer A., Thete A., Romanus H., Csaki A., Kohler J.M.*, Au/Ag/Ay double shell nanoparticles with narrow size distribution obtained by continuous micro segmented flow synthesis // Chem Eng J.-2011.-**166**.-P. 1164-1169.