Nanocomposites and nanomaterials

New hybrid nanocomposites based on star-like poly(N-isopropylacrylamide)

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The growing progress in nanotechnology and life sciences demonstrates an urgent need for novel advanced hybrid materials composed of biocompatible polymers and inorganic component. It is known that Ag nanoparticles possess a remarkable biomedical application. However, because of their high surface energy they have tendency to aggregation that can change their biological activity . To prevent their aggregation the polymer matrices use. Hybrid nanocomposites containing polymer as nanocarrier with embedded Ag nanoparticles have perspectives to use as nanosystems allowing to increase the efficiency of toxic drugs incorporated into polymer matrix.

In the recent years stimuli responsible polymers base on poly(N-isopropylacrylamide) (PNIPAM) with lower critical solution temperature (LCST) become a subject of study as a promising polymer for fabrication of the nanocomposites for biomedical application. PNIPAM has a lower critical solution temperature (LCST) around 32°C, it is close to the body temperature. Stimuli responsible polymers based on poly(N-isopropylacrylamide) is discussed as promising approach to novel drug delivery nanosystems fabrication.

Star-like copolymer with dextran core and grafted poly(N-isopropylacrylamide) arms (D-g-PNIPAM) was synthesized, characterized and used as matrix for silver sols preparation. The comparative study of behavior of individual D-g-PNIPAM and system D-g-PNIPAM/embedded silver nanoparticles in the temperature range near lower critical solution temperature (LCST) has been done by UV-Vis and photoluminescence spectroscopy, DLS, and TEM. It was shown that the thermally induced collapse of end-grafted poly(N-isopropylacrylamide) chains above the LCST doesn't affect the size characteristics of silver nanoparticles in the sols.