Nanocomposites and nanomaterials

Drug delivery systems based on silicon nanoparticles

V.S. Solntsev[1], T.I. Gorbanyuk[1], V.G. Litovchenko[1], T.B. Zheltonozhskaya[2], N.M. Permyakova[2]

[1] *Institute of Semiconductor Physics, National Academy of Science of Ukraine, 41 prospect Nauki, 03680, Kiev, Ukraine, e-mail: solarstar@ukr.net*

[2] *Kiev National University of Taras Shevchenko, Vladimirskaya, 60, Kiev-03680, Ukraine.*

Last time many research works [1, 2, 3] much interest has focused on the use of composite and hybrid materials containing the nanoparticles as the drug delivery systems. It is caused by their ability to encapsulate the pharmaceuticals thereby increasing its stability during metabolism processes and the circulation time in the human body, also helps to reduce the therapeutic dose of medication reducing the adverse effects. Another promising class of materials includes mesoporous silicon and/or polymer hybrids containing nanoparticle for controlled release of biologically active species.

The present work describes the results of an investigation in which the formation processes, microstructure and chemical composition of hybrid materials based on the polymeric matrices including the silicon nanoparticles were studied and discussed. Silicon nanoparticles were obtained by grinding the porous silicon with an average pore size of 2÷8 nm and a specific surface area about 600 $m^2 \cdot g^{-1}$.

Moreover, the possibility of creating "core-shell-type" silicon nanocarriers due to adsorption of the micelle-forming block copolymers in aqueous medium was established.

The results of investigations showed new possibilities of composition polymer/ nanoparticles films as compared to those of pure polymer films. This opens new opportunities for the creation of drug delivery systems with a high efficacy, which ones have new features and new mechanisms of action.

1. *T. Joseph, R. Moore.* Drug delivery using nanotechnology technologies, markets & competitive environment *// Report. - Institute of Nanotechnology. – 2008.*
2. *Kim JS, Кик E, Yu KN et al.* Antimicrobpial effects of silver nanoparticles // *Nanomedicine. – 2007. – Vol. 3(1): – P. 95-101.*
3. *Tartaj P, Morales MdP, Veintemillas—Verdaguer S et al.* The preparation of magnetic nanoparticles for applications in biomedicine. // *J Phys D Appl Phys. – 2003. – Vol. 36(13). – P. l82-197.*