Nanocomposites and nanomaterials

Effect of graphene oxide on the properties of porous silicon

I.B. Olenych[1], O.I. Aksimentyeva[1], L.S. Monastyrskii[1], Yu.Yu. Horbenko[1], M.V. Partyka[1], L.I. Yarytska[2]

[1] *Ivan Franko National University of Lviv, 50 Dragomanov Str., Lviv-79005, Ukraine. E-mail: iolenych@gmail.com*

[2] *Lviv State University of Live Safety, 35 Kleparivska Str., Lviv-79000, Ukraine.*

The rapidly growing interest of graphene is predominantly attributed to its unique electronic and optical properties which leading to the expansion of its applications in diverse field such as sensors, energy storage devices and photodetectors. One of the promising methods for producing graphene is via chemical exfoliation and oxidation of graphite to produce graphene oxide (GO) followed by subsequent reduction. GO is therefore regarded as the most important precursor material. GO has received great interest because of its superior dispersion ability in water and electronic band gap different with respect to graphene. Nanocomposites based on reduced GO and light-emitting porous silicon (PS) are promising in optoelectronics [1]. They are perfect candidates for electrode materials for supercapacitor applications [2].

In this work, a GO−PS hybrid structure is realized in order to investigate their photoluminescent and electronic properties. GO−PS is characterized by Fourier transform infrared spectroscopy, steady-state photoluminescence, atomic-force (AFM) and scanning electron microscopy (SEM). Electrical parameters of hybrid nanostructures were investigated in modes of alternating and direct current. CVCs of GO–PS structures are of varistor character and were studied using AFM tip which was positioned on GO surface plate. It was found that the GO films are transparent to the excitation and fluorescence emission of PS. Electrical parameters of hybrid nanostructures GO–PS make it possible to use the composite material for sensory electronics and energy storage.

1. *Rea I., Sansone L., Terracciano M., De Stefano L., Dardano P., Giordano M., Borriello A., Casalino M.* Photoluminescence of graphene oxide infiltrated into mesoporous silicon // J Phys Chem C.-2014.-**118**.-P. 27301-27307.

2. *Oakes L., Westover A., Mares J.W., Chatterjee S., Erwin W.R., Bardhan R., Weiss S.M., C.L. Pint.* Surface engineered porous silicon for stable, high performance electrochemical supercapacitors // Sci Reports.-2013.-**3**.-3020. – DOI: 10.1038/srep03020.