Nanocomposites and nanomaterials

Composite sensory elements based on poly-3,4-ethylenedioxytiophene doped by carbon and silicon nanoparticles

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The development of nanoelectronics is associated with the search for new low-dimensional composite materials with predictable properties in which combine systems of semiconductors - polymer film. Today intensively studied hybrid nanosystems based on conducting polymers of porous silicon (PS) and carbon nanotubes (CNT). Based on nanocomposites electronic, optical, sensor systems in order to maximize the use of size effects and large specific surface area are created [1,2]. It is expected that the use of composites based on poly-3,4-ethylenedioxytiophene (PEDOT) with carbon nanotubes (CNT) and porous silicon (PS) nanocrystals can enhance the adsorption sensitivity, selectivity and stability of thin film sensors. Therefore, the aim of this work was to studying the effect of adsorption of different gas molecules on the electrical parameters of film sensory systems based on PEDOT–CNT–PS.

Using the methods of IR and luminescent spectroscopy the molecular composition of the obtained materials and mechanisms of the interaction of their components has been studied. It was found experimentally that the electrical characteristics of the thin film sensor elements are strongly dependent on contents of the nanocomposite and the surrounding atmosphere. The increase in relative humidity resulted in a significant increase in resistance of hybrid films of PEDOT–CNT and decrease electrical resistance of films PEDOT–CNT–PS. Adsorption sensitivity of the sensor elements is greater within a humidity of 85–100%. Response time of sensory elements to changing of the gas concentration was about 30 s, which is sufficient for the microelectronic humidity sensors.

1. *Ma P.C., Tang B.Z., Kim J.-K.* Effect of CNT decoration with silver nanoparticles on electrical conductivity of CNT-polymer composites // Carbon.-2008.-**46**.-P. 1497–1505.
2. *Monastyrskii L.S., Aksimentyeva O.I., Olenych I.B., Sokolovskii B.S.* Photosensitive Structures of Conjugated Polymer - Porous Silicon // Mol. Cryst. Liq. Cryst.-2014.-**589**.-P. 124–131.