Physico-Chemical nanomaterials science

Physico-chemical properties of magnetite modified by benzoindocyanine dye

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Relevant work is dedicated to the use of nanostructures based on magnetite and indocyanine dye in the photodynamic therapy of cancer. The creation of such nanostructures requires implementation of complex fundamental and applied physics investigations, aimed at the study of the principles and approaches that ensure, in particular, the possibility of efficient energy use electromagnetic radiation visible or near infrared range in terms of the biological environment.

Nanosized magnetite (Fe_3O_4) surface was functionalized by (3-Mercaptopropyl)trimethoxysilane ($Si(OMe)_3(CH_2)_3$-SH) followed by covalent attachment of indocyanine dye derivative (3428 SL). Obtained Fe_3O_4/SiO-$(CH_2)_3$-SH/3428 SL nanocomposite structure showed at fig.1. Diffusion reflectance spectra confirmed binding of indocyanine dye on magnetite surface (λ_{max} = 780 nm).

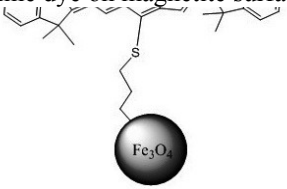

Fig. 1. Structure of Fe_3O_4 / $(CH_2)_3$-SH / 3428 SL nanocomposite.

Nanocomposites where studied by FTIR, UV/Vis, and fluorescence spectroscopy.

Use of magnetic nanoparticles (contrast agents for MRI) with immobilized near-infrared dyes (photodynamic therapy agents), reveal great potential for creation and use of new nanomaterials in cancer therapy and diagnostics.