

PLENARY PRESENTATIONS

TECHNOLOGY FOR THE DEVELOPMENT OF HYDROPHOBIC, BIOCOMPATIBLE AND SELECTIVE NANOSORBENTS FOR MEDICAL APPLICATIONS

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The proposed technology is based on an innovative approach and novel methods for synthesizing composite materials through the formation and nanostructuring of nanoscale fluoropolymer coatings on the surfaces of polymeric and inorganic solid matrices.

New radiation-assisted processing regimes, together with alternative non-radiation methods for producing materials with nanoscale fluoropolymer coatings, have been developed. These approaches have enabled the fabrication of a new generation of composite materials exhibiting unique physicochemical and mechanical characteristics that surpass those of existing international counterparts. The resulting materials demonstrate fundamentally new functional effects and properties.

The scientific novelty and practical significance of the proposed methods for the preparation and application of composite sorption materials for the isolation and purification of biopolymers have been confirmed by granted patents and positive patent decisions in Russia, Ukraine, Europe, the United States, and international patent systems.

The developed technology enables the fabrication of composite nanosorbents with precisely tailored properties, including:

- controlled hydrophilic and hydrophobic surface characteristics;
- adjustable resistance to chemically aggressive media;
- predetermined pore structure and porosity;
- selective sorption capacity toward ions, toxins, and other target compounds;
- excellent biocompatibility and hemocompatibility;
- multiple regeneration capability;
- enhanced mechanical strength;
- high thermal and heat resistance;
- superior chemical resistance;
- nonflammability.

Industrial implementation of the technology for manufacturing modified nanosorbents, together with the high quality and relatively low production cost of the resulting products, provides significant competitive advantages over existing foreign analogues.

At present, fluoropolymer-containing composite materials have found wide applications in medicine, biotechnology, and pharmaceutical science. A hemosorbent based on activated carbon has successfully undergone preclinical and clinical evaluation in leading medical institutions of Russia and Uzbekistan. It has been registered by the Ministries of Health of both the Russian Federation and the Republic of Uzbekistan and has been recommended for industrial-scale production.