

# Nanocomposites and nanomaterials

## Novel ferromagnetic nanocomposites for biomedical applications

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Today, there are problems of creating new biomaterials using scientific advances in the field of powder metallurgy, materials science, biochemistry, biotechnology and medicine. These problems can be resolved on the basis of studying physicochemical and biomedical properties of these powders. Theoretical and methodological recommendations for assessment of influence of nanocomposites onto living organisms cells through the study of their physicochemical and biomedical properties are also absent.

Ferromagnetic nanocomposites with desired physical, chemical, medical, and biological properties were obtained by thermochemical method.

Mechanism of formation of nanodisperse particles of metal compounds with desired physical, chemical, and medico-biological properties was studied. Physicochemical conditions of synthesis of metal-based composite powders, and also physical and chemical changes occurring during the ferromagnetic nanoparticles formation by chemical methods with subsequent reduction in reducing environments were investigated.

Investigation of physical properties of ferromagnetic nanocomposites was done by methods of X-ray phase, structural, and fluorescent analysis, of electron microscopy, NGR spectroscopy, of determination of specific surface of powders by thermal desorption of argon, and by magnetometric methods. Thus, phase composition, structure, specific surface, magnetic properties, particle size etc. were determined.

Investigation of chemical properties of ferromagnetic nanocomposites was done by methods of elemental analysis, derivatography, corrosion studies, determination of surface hydrophilicity by heats of wetting, adsorption properties studies, and by spectral methods. Chemical composition of ferromagnetic nanocomposites, chemical state of metal atoms in their composition, the degree of hydrophilicity and adsorption properties of the surface were determined.

Experimental medico-biological estimation of relative safety of ferromagnetic nanocomposites was done by determination of the degree of solubility of nanopowders of different dispersion degree, by study of the acute toxicity of powders during peroral, intravenous, and parenteral administration of them. Hazard class of ferromagnetic nanocomposites was determined, recommendations for their use in biology and medicine were developed.