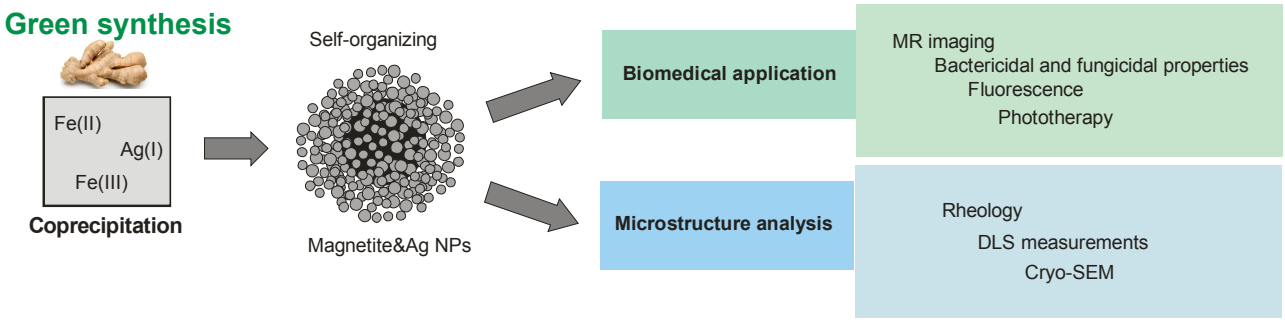
DESCRIPTION FOR THE GENERAL PUBLIC

Analysis of scientific literature showed that multimodal nanoparticles (NPs) are the most promising trend in nanobiomedicine. Combinatory therapies with the use of multimodal nanomaterials ("combo" nanomedicine) were recognized to be the most progressive trend for efficient, targeted, and safe therapy. However, the production of such multimodal NPs faces challenges in both technological and biological areas. The project suggests the solutions of some current problems of multimodal NPs: easy one-step synthesis procedure, eco-friendly approach, high stability of their dispersions. In our project we propagate green approach – using of plant extracts as capping agent – that will reduce toxic effect and increase biocompatibility of NPs as well as reduce pollution of wastewater. We aim to conduct fundamental investigations on the preparation, biomedical application and microstructure analysis of theranostic nanocomposite based on magnetite and silver nanoparticles (MAg) produced by one-step nature-friendly synthesis. Such a theranostic nanoplatform will combine fluorescence, bactericidal, fungicidal properties and ability to enhance magnetic resonance imaging (MRI) contrast. The developing theranostic nanocomposite may be potentially used for effective treatment of resistant infections caused by bacteria biofilms or fungi. In adition, fluorescence and MRI contrasting properties would allow monitoring the drug delivery process and efficacy of the treatment.

The project is mainly focused on the investigation of two aspects of MAg: biomedical potential and microstructure of gels:



The results of microstructure analysis of MAg might be the subject of some further development and open novel areas for their application. In particular, the NPs ability to self-organization may be potentially used for scaffolds production and cell culturing in tissue engineering.

As for methodology, in order to investigate biomedical potential of MAg, we are going to study their ability to enhance the MR imaging, antimicrobial and fungicidal properties, fluorescence, photo- and cytotoxicity. Microstructure of MAg will be studied by cryo-SEM microscopy technique, dynamic light scattering and rheological measurements. Physicochemical properties of the MAg will be estimated using adequate spectroscopic, microscopic and X-ray methods.