

Scientists of SibFU develop gilded nanodisks for medical purposes

Young scientists from SibFU together with their colleagues from FRC KSC SB RAS are developing a technology for creating multilayer gilded nanodisks for targeted drug delivery and treating malignant tumors using dip pen nanolithography (DPN).



*“Magnetic nanodisks coated with gold are in high demand in Biology and Medicine. They can be successfully used for magnetically induced apoptosis (the process of programmed cell death) and mechanical destruction of cell membranes. Nanodisks can be “programmed” to deliver drugs exclusively to diseased organs and tissues, and they can also mechanically destroy target cells (for example, malignant tumor cells). To place the nanodisks into the human body, they need to be “dressed” in a special coating that will reduce the toxicity of our agents, prevent their early degradation in the body and allow them to “increase” the aptamers on them for targeted delivery of medicines. Therefore, the structure of the disks is multi-layered and consists of a ferromagnetic metal coated with gold. Nowadays, a high-vacuum deposition method is used in combination with lithography methods and chemical etching processes to obtain such nanodisks, which determine the shape and size of the final product,” — says **Anna Lukjanenko**, the assistant of the specialized department of Solid State Physics and Nanotechnology at Siberian Federal University, scientist of Kirensky Institute of Physics SB RAS.*

To produce nanoparticles with a large variety of shapes and sizes and strict control of their parameters for manufacturing disks for the needs of medicine, university scientists are developing more economical and flexible technology compared to the existing one.

“We want to improve the technology of dip pen nanolithography so that multilayer thin films of metals can be used as substrates. Then, dip pen nanolithography will help us produce precisely those nanodisks which are required by the medical research groups involved in introducing new treatment methods (for example, researchers from Krasnoyarsk State Medical University named after Professor V. F. Voino-Yasenetsky). Also, this method can be implemented in almost any production such as a plant and or a research center,” — the scientist states.

As of today, the project working group is determining the optimal parameters in the chamber of the device NanoInk, Ink. DPN 5000 to create nanoscale objects on the surface of a gold film. A comprehensive study of the obtained thin films is being carried out, along with the selection of chemical reagents and the calibration of etching rates. Testing with biological objects are scheduled for 2019.

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