

Research of Surface Plasmon Resonance at The Silicon Nano-Silver Interface in the Information Recording Unit of the Diagnostic Complex Intest

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The scientific and technical team of "SERVET" together with MATI - RGTU named after Tsiolkovsky (currently MAI) and the Institute of Virology named after Ivanovsky (now the Institute of Epidemiology and Microbiology named after N.F. Gamaleya) over the past few years, research and development work has been carried out in the development of new methods of medical diagnosis of infectious diseases, as well as equipment associated with early and rapid detection infectious diseases in humans, determining the qualitative and quantitative characteristics of infections in the human body. A working sample of a compact medical diagnostic complex that has no analogues in the world for express diagnostics of the human body for the presence of pathogens of infectious diseases, which was named "Diagnostic complex Intest" was created. The use of Diagnostic Complex Intest" in medical practice will allow you to immediately (up to 1 minute instead of 1-3 days) receive information about the presence or absence of various pathogens in the patient's body without sampling material" (blood, sputum, tissue, etc.) and / without ruining the skin (cuts, punctures) and/or introducing any diagnostic device into the human body. The main fundamental diagnostic mechanism is the registration of emissions of acoustic-electromagnetic fields of the DNA structure. It is known that the characteristics of radiation are individual. Currently, the team of authors is faced with the task of switching to a contactless method of recording and retrieving information using the phenomenon of surface plasmon resonance.

Upon contact with biological objects (DNA, viruses, antibodies), plasmonic effects can increase the intensity of fluorescence signals by more than an order of magnitude, that is, significantly expand the possibilities of detecting, identifying and diagnosing biological objects. As our research has shown, the phenomena of plasmon resonance are also used when registering information in the diagnostic complex Interest" developed by us. At the same time, the occurrence of plasmon resonance depends on a large number of factors, such as the shape of nano elements, material, frequency of incident radiation. In particular, the properties of localized plasmons critically depend on the shape of nanoparticles, which allows tuning the system of their resonances for effective interaction with light or elementary quantum systems. To study this process, a mathematical model was developed, and calculations were carried out to optimize the above parameters and develop new technologies. Based on these calculations, preliminary experiments were carried out, and a schematic diagram of a contactless version of the device was developing.