"Nanoplasmonics and surface enhanced spectroscopy»

Internal reflection of the surface of a plasmonic substrate covered by active nanoparticles

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Surface electromagnetic waves propagating along the surface of a metal covered by active nanoparticles are highly sensitive to small change in optical parameters of individual particle. Optical properties of particles placed on a surface depend on the nature of the interface, a local environment, and their shapes. The latter gives the possibility to tune the excitation of surface plasmon polariton (SPP) existing in the system what was demonstrated theoretically [1].

Nanoparticles with the size between 1nm and 100 nm may play a role of natural bridges between molecules and extended solid interfaces. In this connection one of perspective planar systems for development biochemical sensors may be layers of cylinder-like active particles placed on a metallic interface.

Theoretical model based on the conception of effective susceptibility of a layer of nanoparticles placed on the surface of solid [2] was developed to study the features of the reflection spectrum of the layer in Kretchman geometry.

It was found that, for the fixed angle of incidence, there is an additional minimum in the reflection spectrum for p- polarized excitation wave. Parameters of this minimum may be controlled by changing the size and shape of the particles. The presence of the layer of particles can produce the second minimum in the angular dependence of the reflection coefficient too. These minima are connected to the excitation of localized SPP wave in the layer of cylindrical particles because of particle-particle interactions and interaction between two kinds of plasmons.

1. *Lozovski V.* The effective susceptibility concept in the electrodynamics of nano-system // J. Comput. Theor. Nanosci. -2010.-**7**,-P.7-17.

2. *Chegel, V.,Demidenko Yu.,Lozovski V,.Tsykhonya A.*. Influence of the shape of the particles covering the metal surface on the dispersion relations of surface plasmons // J. Surf.Sci.-2008.-**602**,-P. 1540-1546.