Nanocomposites and nanomaterials

Modeling Optical Properties of the Multilayer Nanoshells for Biomedical Applications

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Achievement in the synthesis of metal nanoparticles and their optical properties caused interest to using plasmon resonance phenomena for application in modern photonics, as well as in biotechnology [1].

For use plasmon resonance nanoshells for diagnostic and therapeutic purposes, it should be excited in the window transparency of biological tissues. Spectral settings nanoparticles plasmon resonance in this range and relationship between the efficiency of their absorption and scattering can be controlled by changing the size, shape, material and structure of nanoparticles [2].

The paper studied the spectral dependence of provisions plasmon resonance multilayer metal nanoshells on their size (thickness and semiaxes) and the ratio of the radii of core/shell. Are derived explicit expressions for the calculation multilayer nanoshells based on the famous circuit calculation bilayer nanoparticles using the principle of dipole equivalence.

Have been calculated and modeled absorption and scattering cross sections of radiation three-layer nanoshell Au-SiO$_2$-Au ellipsoid shape for near-infrared region of the spectrum. A comparison of optical characteristics two-layer with of three-layer elliptical nano-shell and size of the absorption cross sections. Investigated dependence of absorption cross sections of a three-layer elliptical nanoshell Au-SiO$_2$-Au from changing radius upper shell.

1. *Loo, C.; Lowery, A.; Halas, N.; West, J.; Drezek, R. Nano Lett.2005, 5,709.*
2. *Khlebtsov N.G.* Optics and biophotonics of nanoparticles with plasmon resonance // Quantum Electronics. *2008. -38, № 6. -P. 504 – 529.*