

Nanocomposites and nanomaterials

Modeling optical parameters of multilayer nanoshells to improve plasmon resonance efficiency

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In recent years, more and more attention is given to research of metal nanoparticles because they have unique optical, chemical and biological properties. These particles effectively scatter and absorb optical radiation at a given wavelength. These effects, especially plasmon resonance, have been widely used in biotechnology, photocatalysis, photonics and other branches of science and technology.

A usage of nanoobjects which consist of a dielectric core and a thin metal shell, so-called nanoshells, allow significantly extend the working range of wavelengths shifting it to a desired area. This is achieved by a choice of material and geometry of nanoobject and by selection of inner and outer radii of the metal shell [1,2].

In this work the optical properties of the three-layer metal nanoshells of spherical form is investigated. As materials of core and shells titanium dioxide (TiO₂), gold (Au) and silver (Ag) are selected. A comparison of two structures: dielectric-metal-dielectric and metal-dielectric-metal is considered and done. A calculation of cross section of absorption and scattering of three-layer nanoshells for near infrared region of the spectrum is carried out using principle of dipole equivalence.

1. *V.V. Kulish* Single-electron optical properties of metallic nano shells with concentric core. Taking into account the quantization of the electron spectrum // Ukrainian Journal of Physics. 2011. - **56**, № 6.- P. 579-587.
2. *Khlebtsov N.G.* Optics and biophotonics of nanoparticles with plasmon resonance // Quantum Electronics. 2008. -**38**, № 6. -P. 504 – 529.