Optical Properties of Au-CuS Core-Shell Nanoparticles

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Abstract

The plasmon properties of spherical and ellipsoidal Au -CuS nanoparticles with different sizes were determined. It is established that the intensity of the extinction cross section of spherical nanoshells strongly depends on the ratio between the thickness of the core and the shell. Ellipsoidal oblate and core-shell prolate nanoparticles spectra are characterized by two maxima. Au-CuS nanoparticles can be used as potential elements of various sensitive applications

Fig.1. Extinction spectra :

a) of spherical Au nanoparticles with diameter from 10 to 100 nm located in the surrounding medium with a refractive index of 1.0;

Optical properties of spherical nanoparticles



b) of spherical nanoparticles of copper monosulfide with a variable diameter from 10 to 100 nm located in a medium with a refractive index of 1.0;

c) of spherical Au/CuS nanoshells with a constant diameter $d_2 = 100$ nm located in a medium with a refractive index of 1.0. The core diameter d_1 varies from 1 to 99 nm;

d) of spherical Au/CuS nanoshells with a constant core diameter $d_1 = 10$ nm located in a medium with a refractive index of 1.0. The shell diameter d_2 varies from 11 to 100 nm

Optical properties of ellipsoidal nanoshells



Fig.2. Extinction spectra

a) of vertically placed ellipsoidal Au/CuS nanoshells with fixed axis lengths $a_2 = 50$ nm; $b_2 = 100$ nm located in a medium with a refractive index of 1.0. The lengths of the a_1 and b_1 axes vary from 1 to 49 nm and from 2 to 99 nm respectively;

b)of spherical Au/CuS nanoshells with a constant core diameter $d_1 = 10$ nm located in a medium with a refractive index of 1.0. The shell diameter d_2 varies from 11 to 100 nm;

c) of horizontally placed ellipsoidal Au/CuS nanoshells with constant axis lengths $a_2 = 100$ nm; $b_2 = 50$ nm located in a medium with a refractive index of 1.0. The lengths of the a_1 and b_1 axes vary from 2 to 99 nm and from 1 to 49 nm respectively;

d) of horizontally placed ellipsoidal Au/CuS nanoshells with constant axis lengths $a_1 = 10$ nm; $b_1 = 5$ nm located in a medium with a refractive index of 1.0. The lengths of the a_2 and b_2 axes vary from 12 to 100 nm and from 6 to 50 nm respectively.

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