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Investigating the size effect in the dielectric function of spherical nano particles and determining their allowed radial interval for experimentally produced samples

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Abstract

A new method is developed to calculate the mean free path of electrons in spherical nano particles and related Γ(R) in the Drude model; accordingly, we have corrected ϵ (R,ω). The new dielectric function is inserted in the series expansion of extinction and absorption cross sections in the Mie Theory. After plotting the real and imaginary part of ϵ (R,ω) in 3D graphs, and C_{ext} and C_{abs} in other 3D graphs, we show that the SPR's positions are relatively constant for two samples; meanwhile, it is displayed that the absorbance for these two samples have visible changes. At last, in two separate 3D graphs, we have plotted the variation of wave length and absorbance against radius and standard deviation to estimate the radius range for experimentally produced gold nanoparticles. We have estimated the radius to be 17 ~ 20 nm for the immediately prepared sample and 12~14 nm for the same sample illuminated with pulsed laser. These results are consistent with the experimental data of TEM images.

Keywords: nano particles,dielectric function,mie thoeory, 3D absrpion diagram

For full article, refer to the Persian section