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Size measurement of gold and silver nanostructures based on their extinction spectrum: limitations and extensions

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Abstract

This paper reports on physical principles and the relations between extinction cross section and geometrical properties of silver and gold nanostructures. We introduce some simple relations for determining geometrical properties of silver and gold nanospheres based on the situation of their plasmonic peak. We also applied, investigated and compared the accuracy of these relations using other published works in order to make clear the effects of shape, size distribution and refractive index of particles' embedding medium. Finally, we extended the equations to non-spherical particles and investigated their accuracy. We found that modified forms of the equations may lead to more exact results for non-spherical metal particles, but for better results, modified equations should depend on shape and size distribution of particles. It seems that these equations are not applicable to particles with corners sharper than cubes' corners i.e. nanostructures with spatial angles less than $\pi/2$ sr.

Keywords: silver and gold nanostructures, size measurement, optical properties, extinction spectrum, geometrical properties

For full article, refer to the Persian section