

Nanoscale Biomolecular Detection Limit for Gold Nanoparticles

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Abstract

Gold Nanoparticles have been widely used during the past few years in various technical and biomedical applications. In particular, the resonance optical properties of nanometer sized particles have been employed to design biochips and biosensors used as analytical tools. The optical properties of non-functionalized gold nanoparticles and core-gold nanoshells play a crucial role for the design of biosensors where gold surface is used as sensing component. Gold nanoparticles exhibit excellent optical tunability at visible and near-infrared frequencies leading to sharp peaks in their spectral extinction. In this paper, we study how the optical properties of gold nanoparticles and core-gold nanoshells are changed as a function of different sizes, shapes, composition and biomolecular coating with characteristic shifts towards near-infrared region. We show that the optical tunability can be carefully checked for particle sizes falling in the range 100-150nm. The results should improve the design of sensors working at the detection limit.