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Ultra small clusters of gold nanoshells detected by SNOM

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Abstract:

Metal nanoshells are a type of nanoparticle composed by a dielectric core and a metallic coating. These nanoparticles have stimulated interest due to their remarkable optical properties. In common with metal colloids, they show distinctive absorption peaks at specific wavelengths due to surface plasmon resonance. However, unlike bare metal colloids, the wavelengths at which resonance occurs can be tuned by changing the core radius and coating thickness. One basic application of such property is in medicine, where it is hoped that nanoshells with absorption peaks in the near−infrared can be attached to cancerous cells. In this paper, we study the changes of optical response in visible and near infrared wavelengths from single to randomly distributed clusters of nanoshells. The results were obtained using a novel formulation of Mie theory in evanescent wave conditions, with a finite−difference time−domain (FDTD) simulation and experimentally on $BaTiO_3$−gold nanoshells using a scanning near−optical microscope. The results show that the optical signal of a randomly distributed cluster of nanoshells can be supplementary tuned with respect to the case of single nanoshell depending by the geometric configuration of the clusters.