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Quantum plasmon resonances and coupling of small nanoparticles ZAPATA-HERRERA MARIO, FLOREZ JEFFERSON, CAMACHO ANGELA, Universidad de los Andes — In this work, we propose to extend a theoretical quantum approach to describe the behavior of the optical response as a function of both size and shape of small metal nanoparticles. By using classical models as well as quantum approaches we also want to study the nanoparticle's permittivity in the whole range of nanometers in order to define the different regimes at the nanoscale. In particular, we are interested in examining size and shape effects on the enhancement field factor and the absorption spectra for comparing with possible experiments. We study the role played by Localized Surface Plasmon Resonance in the coupling of small metal nanoparticles pairs by varying the distance between them by using an analogy between molecular electronic states and plasmonic excitations as a function of particle size and shape. We pay special atention on tunnelling and multipolar effects in order to predict the regime of dimer formation. The main interest in understanding the plasmon resonances of small nanoparticles lies in the applications in biology, catalysis and quantum optics.

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