Abstract

Theory of the Optical Properties of DNA-Modified Gold Nanoparticle Composites

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DNA-modified gold nanoparticle composites are materials consisting of many small gold particles (with diameters typically of order 20–40 nm) linked together by DNA strands. The optical properties of such composites depend dramatically on temperature [1,2]. At high temperatures, there is a strong extinction peak around 500 nm which is attributed to the surface plasmon resonances of individual gold nanoparticles, but as the temperature is lowered, this peak shifts towards longer wavelengths and broadens substantially. In this talk, we will describe a theory for this temperature-dependent change. The theory consists of two parts: (i) a model for the temperature-dependence of the composite structure, which is responsible for the change in the optical properties and (ii) a model calculation for the extinction coefficient of the composite, based on an application of the discrete dipole approximation [3] to the temperature-dependent structure.

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