Service Interdisciplinaire sur les Systèmes Moléculaires et Matériaux
SÉMINAIRE

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Jeudi 12 novembre 14h30

CEA-Saclay ¡b¿¡font color =’red’¿SIS2M¡/font¿¡/b¿ Bât 125, pièce 157

Synthesis and assembly of colloidal plasmonic nanoparticles

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The reduction of size in metallic materials has lead to the discovery of novel and exciting optical properties, which are mainly related to the localized surface plasmon resonance of conduction electrons. For the preparation of such reduced-size metals, as an alternative to the traditional top-down (lithographic) methods, bottom-up processes have acquired a large popularity in the past decade, mostly based on wet-chemical methods which rely on the long-acquired knowledge on Colloid Science. Colloidal techniques can be tailored to obtain particles with different shapes while controlling particle size, which in turn affects the optical response of the material. In this talk, a survey will be given of wet-chemistry based techniques recently developed to synthesize noble metal nanoparticles with controlled size and shape. The shapes will include spheres, core-shells, rods, flat prisms and other polyhedra, which can be prepared in a wide (nano)size range. The resulting optical properties, which are mainly influenced by the surface plasmon resonance of conduction electrons, will be discussed for the various shapes and sizes, using several theoretical models, increasing in complexity when the particles deviate from the spherical shape. Examples of the various shapes are shown in Figure 1, and characteristic extinction spectra are shown in Figure 2 for gold spheres, decahedra and rods of selected sizes, showing that the localized surface plasmon can be tuned to basically any position within the visible spectrum. Among the various selected shapes, anisometric nanoparticles have been found particularly appealing, since they display various resonance conditions as a function of orientation, resulting in an anisotropic response toward incoming light, which allows for further manipulation of the optical effects, through alignment. Examples of optical manipulation through variations in the polarization of incident light for aligned Au nanorods will be discussed to illustrate this effect.

Le cafe sera servi 10 minutes avant
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