Coupled and Chiral Surface Plasmons in Metal Nanostructures

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The presentation will provide examples of modulating the optical properties of nanomaterials by integrating them into higher order assemblies using electrostatic, supramolecular and covalent approaches [1-7] Various approaches to organize metal nanoparticles by varying the distance and geometry will be discussed in the first part of the presentation, highlighting the role of plasmon coupling and SERS[1-6]. Raman signal enhancement of different analyte molecules, when placed at various locations of these assemblies (such as junctions and edges) will be presented [5]. Enhancement of Raman signals of pyrene molecule due to the enhanced electric fields on the surface of silver nanoparticles, by controlling the thickness of silica shell, will be discussed [6]. Dimeric nanostructures having well defined gap between two silver nanoparticles were prepared and the gap size (d) was varied from $1.5 - 40$ nm [6]. The experimental Raman enhancement factors at the hot spot follow a $\frac{1}{d^n}$ dependence with n = 1.5, in agreement with the recent theoretical studies by Schatz and co-workers [8].

In the second part of the presentation, a novel strategy for inducing chirality to metal nanoparticles, by growing them on peptide nanotube surfaces will be discussed [7]. The surface plasmon coupled circular dichroism in these systems originates from the asymmetric organization of Au nanoparticles, resulting in bisignated CD signals. The chiral information and asymmetry at the molecular level on the D- and L-isomers of peptide nanotubes are transferred to gold nanoparticles.

References

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