Synthesis and Self-assembly of Gold Nanoparticles

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Bottom-up fabrication through self-assembly of nanoparticles offers a unique opportunity of invoking emergent properties in a given material and incorporation of responsiveness to a stimulus. The execution of the self-assembly process requires however highly monodispersed building blocks.

The first part of the talk will deal with the optimisation protocol for anisotropic nanoparticles. We showed that thermal treatment of conventional gold seeds leads to the formation of twin planes that increase their morphological stability over time. Such stable seeds with controlled crystal properties improve the yield in the seeded growth pentatwinned nanoparticles, gold nanorods, bipyramids, and decahedra.[1]

In the second part of the talk, we will discuss the dynamic solvent-induced nanoparticle self-assembly. It is commonly agreed that limiting factor of solvent-induced nanoparticle self-assembly is the need for constant sample dilution in the cyclic assembly that by altering the kinetics of the subsequent assembly process limit the optical signal recovery. We showed that upon confining hydrophobic nanoparticles in porous silica nanocapsules, the number of nanoparticles participating in cyclic aggregation remains constant despite bulk changes in solution, leading to highly reproducible plasmon band shifts at different solvent compositions.[2]

References

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