Colloidal Gold Nanostructures for Plasmonics

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Our research activities concentrate on the synthesis and assembly of gold nanoparticles (NPs) with tunable sizes and shapes, to provide original materials for research in plasmonics through collaborations [1,2,3,4].

We synthesize non-commercial Au-NPs: nanospheres (perfectly spherical and very large), nanocubes, prisms, nanooctahedra and micro-plates of various size and thicknesses. Perfect spheres and cubes on top of Au-film are very attractive for spectroscopies within the gap; Prisms are promising for ultrasensitive sensing; Plates can spontaneously self-assemble in ordered 1D-columnar aggregates (fig) or 2D-metasurfaces; their large atomically flat facets are promising for F.I.B. fabrication of mono-crystalline structures.

Assembly of such NPs leads to the appearance of new properties, still relatively poorly explored, apart from SERS experiments. Here, we report the spontaneous self-assembly of gold NPs by simply evaporating concentrated solutions on non-patterned substrates. The degree of reproducibility of this method, the maximum size of the perfectly organized area and the key parameters related to a controlled-deposition are presented We are looking for collaborations to study the optical properties of these unusual assemblies and the plasmon-driven chemical reactions that should occur as a result of strong light-matter interation within the hot-spots.

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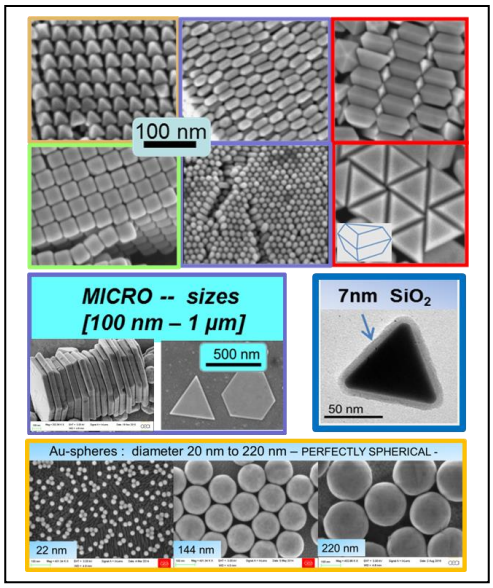

Figure 1: Illustration of some of our monodisperse gold nano-particles, micro-plates and hybrids (Au@SiO_2) with tunable sizes and thicknesses.

References:

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(3) M. Haggui *et al.* ACSnano-2012
(4) C. Deeb *et al.* J. Phys. Chem. C-2012