Gold Nanoparticles for Physics, Chemistry, Biology and Medicine

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Abstract

The illumination of gold nanoparticles (Au-NPs) sets off a cascade of complex processes that are morphology dependent and lead them to act as **nanosources of light, heat and hot-carriers**. Our research activities concentrate on the **synthesis and assembly of gold NPs and nanohybrids** with tunable sizes and shapes, to provide original materials for research in plasmonics [1-7], plasmon-driven chemistry, biology and medicine through collaborations.

We synthesize commercial and **non-commercial Au-NPs** such as cubes, prisms, stars, octahedra, nano/microplates, of various sizes and thicknesses and ultra-small nanorods. **Hot-spots** are prepared through spontaneous 3D self-assembly, by simply evaporating concentrated monodisperse solutions on non-patterned substrates.

According to literature, perfect spheres and cubes on top of Au-film are very attractive for several spectroscopies within the gap. Triangular shaped NPs are particularly promising for ultrasensitive sensing and biomedicine. Au-NPs alone without photosensitizer can generate singlet oxygen ($^1O_2$) for PDT. Hot spots coming from Au-NPs or aggregates on Au-mirror are currently used to study a large number of plasmon-driven chemical reactions. Nano- and microplates can spontaneously self-assemble in ordered 1D-columnar aggregates or 2D-metasurfaces; their large atomically flat facets are used for F.I.B. fabrication of monocrystalline structures.

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