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Synthesis of complex or hybrid plasmonic nanostructures from organometallic precursors through ligand- or surface-controlled protocols

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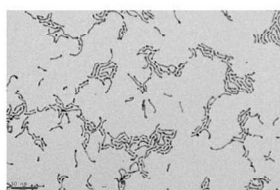
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The control of the main characteristics of nanostructures is a prerequisite for an in-depth study of their properties, which change with size, shape, composition and surface state. At this regard, advanced synthetic protocols have shown that the combination of organometallic precursors with *in situ* changes in their coordination environments by addition of ligands has permitted to achieve a plethora of well controlled metal nanostructures.^[1]

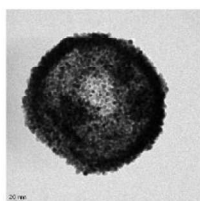
In this communication we show how the control of the reactivity of Au(I) or Au(I)-Ag(I) organometallic precursors such as $[\text{Au}(\text{C}_6\text{F}_5)(\text{tht})]$ or $[\text{Au}_2\text{Ag}_2(\text{C}_6\text{F}_5)_4(\text{Et}_2\text{O})_2]_n$ in the presence of oleic acid as ligand permits the controlled synthesis of new plasmonic gold or gold-silver complex nanostructures.^[2] The precise control of the intermediates formed allows the synthesis of AuAg nanorods (NRs) or nanowires (NWs) (see Figure 1, left) or Au colloidosomes (see Figure 1, center), all of them displaying surface plasmon resonance absorptions in the NIR region.

We have also explored the *in situ* surface coordination chemistry of the bimetallic Au(I)-Ag(I) precursor $[\text{Au}_2\text{Ag}_2(\text{C}_6\text{F}_5)_4(\text{Et}_2\text{O})_2]_n$ to graphitic carbon nitride (g-C₃N₄) 2D surfaces that serves as an interesting precursor for the design of visible-light active photocatalysts based on small size spherical AuAg nanoparticles deposited at the surface of g-C₃N₄ (see Figure 1, right).

Oleic acid-AuAg NRs



Oleic acid-Au colloidosomes



Au-gC₃N₄-TiO₂

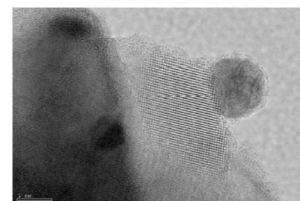


Figure 1. Different metal nanostructures obtained by controlling the *in situ* addition of oleic acid to the organometallic precursors or through the coordination to a g-C₃N₄ surface.

[1] C. Amiens, B. Chaudret, D. Ciuculescu-Pradines, V. Collière, K. Fajerweg, P. Fau, M. Kahn, A. Maissonat, K. Soulantica, K. Philippot, *New J. Chem.* **2013**, 37, 3374-3401.

[2] J. Crespo, J. M. López-de-Luzuriaga, M. Monge, M. E. Olmos, M. Rodríguez-Castillo, B. Cormary, K. Soulantica, M. Sestu, A. Falqui, *Chem. Commun.* **2015**, 51, 16691-16694.