Controlled design of gold-based hybridnanomaterials with core-shell architecture

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Gold-based nanoparticles have been the subject of intense research due to their versatility and potential use in a wide variety of application fields such as plasmonic photocatalysis, plasmon-enhanced spectroscopy or Nanomedicine. Gold at the nanometric scale possess unique optical and catalytic properties that can be further boosted when combined with other metal or oxides to form multifunctional heterostructures. Bimetallic structures can be formed by combining gold with other noble metals such as platinum, silver, or palladium. Metal-semiconductor hybrid structures can also be generated where gold interacts with different semiconductor oxides such as copper or titanium oxides. These novel hybrid materials exhibit synergistic properties that may overcome their individual counterparts. There are multiple strategies to combine and and maximize the interaction of these heterostructures. Herein we present a variety of synthesis approaches using wet chemistry to build multiple core-shell nanoconfigurations. Core-shell structures emerge as one of the most attractive alternatives where the gold core interacts as much as possible with the outer shell. The design and good understanding of these structures is essential to obtain hybrid materials with a targeted optical and catalytic response that can be potentially envisioned for an extensive number of environmental and biomedical applications. We have explored a good number of variables to tune and maximize the characteristics of core-shell gold-based hybrid nanoplatforms. Morphology, pore size, shell thickness or crystallinity of the sample are fundamental parameters to take into account if you pretend to build well-designed core-shell structure.

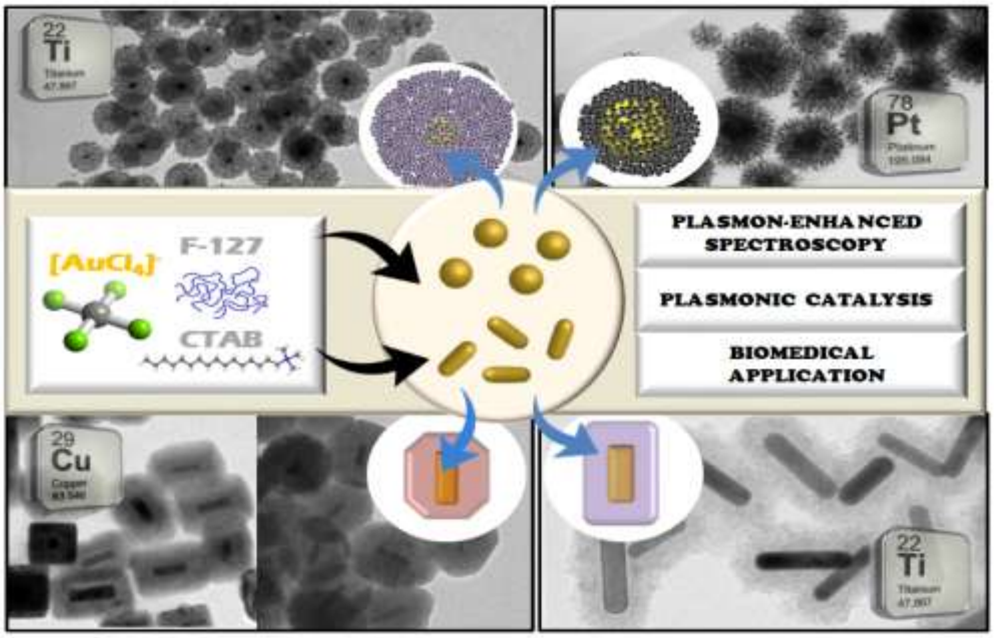

Figure 1: Selection of gold-based core-shell plasmonic configurations

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