Ultrathin Gold-Silver Nanorods and Nanowires Stabilized with Long Alkyl Chain Carboxylic Acids: Synthesis and Plasmonic Properties

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Abstract

The control of the main features of nanostructures is a fundamental prerequisite for a deep study of their properties, which change with size, shape, composition and surface state. The use of organometallic complexes has permitted to achieve a plethora of well controlled metal nanostructures that have been obtained through the precise knowledge of the chemical structures and molecular chemistry of this type of metal precursors.[1]

In this context, bimetallic one-dimensional gold-silver alloy nanostructures have been obtained through the reduction of organometallic perfluoroaryl Au(I)-Ag(I) precursors obtained when long alkyl chain carboxylic acids such as oleic or linoleic acid are used as capping agents.[2,3] When these long alkyl chain carboxylic acids are used as solvent and capping ligand ultrathin nanorods (UNRs) and ultrathin nanowires (UNWs) are obtained. If organic solvents are used in the presence of controlled amounts of carboxylic acids both spherical nanoparticles as well as 1-D nanostructures can be achieved, depending on the reaction conditions.

These 1-D gold-silver nanostructures display a length-dependent broad band from the NIR to the mid IR region that can be related to the longitudinal mode of the surface plasmon resonance (SPR) of these ultrathin nanostructures.

References

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