SILVER NANOPARTICLES AND GOLD METALLODENDRIMERS: FROM MOLECULAR PRECURSORS TO NANOMATERIALS

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The increased interest in the synthesis of new metal-based nanomaterials stems from the fact that new electronic, optical or magnetic properties can be reached at this length scale. These properties can be tuned depending on the size and the shape of the new nanomaterials. By the use of our experience in gold and silver organometallic and coordination chemistry we have carried out the synthesis of metal nanoparticles and nanometer sized metallodendrimers through chemical methods.

The first research line makes use of the organometallic silver precursor $[Ag(C_6F_5)]$ that under mild conditions and in the presence of stabilizers, permits the synthesis of small size silver nanoparticles. This *organometallic method* leads to Ag nanoparticles stabilized in different substrates such as organic ligands (amines), polymers (PVP, cellulose acetate) or inorganic SiO_2 (see Figure 1). Moreover, alkylamine capped silver nanoparticles (ca. 10 nm) display high antimicrobial activity against some representative microorganisms.[1]

We have also focused on the synthesis and study of a series of gold metallodendrimers. These new materials are based on PPI or PAMAM dendrimers functionalized with peripheral PPh_2 groups what permits the coordination of Au(I) fragments. Depending on the dendrimer generation it is possible to design new complexes from the molecular level to the nanoscale. For example, when the periphery of the dendrimer is grafted with Au(I)-thiolate units luminescent metallodendrimers can be obtained (see Figure 2).[2]

References:

[1] E. J. Fernández, C. Torres, J. M. López de Luzuriaga, M. Monge, J. García-Barrasa, Spanish Patent P200700456, 2007.

[2] E. J. Fernández, A. Laguna, J. M. López de Luzuriaga, M. Monge, M. Montiel, M. E. Olmos, R. C. Puelles, E. Sánchez-Forcada, Eur. J. Inorg. Chem. (2007) 4001-4005.

Figures:

Figure 1. Transmission electron micrographs (a and c) of different magnifications and, particle size distribution (b) of HDA capped Ag nanoparticles.

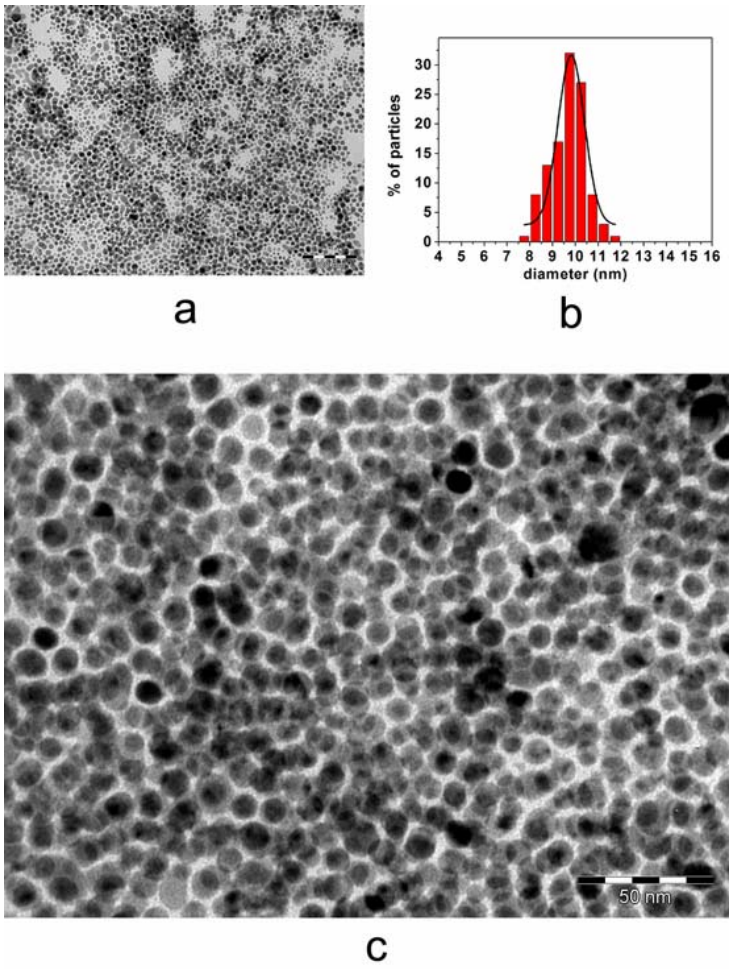

Figure 2. Octanuclear phoshine thiolate gold dendrimers with different 4-substituted benzenethiolates and emission spectra in solid state at 77 K.