ORGANOMETALLIC SILVER COMPOUNDS AS PRECURSORS FOR NANOMATERIALS. USE OF THIOLS AND POLYMERS AS NANOPARTICLE STABILIZERS.

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There is nowadays a great interest in metal nanoparticles due to their unusual chemical and physical properties that have given rise to new applications in many different areas [1,2]. These properties depend on the the size and the shape of the nanoparticles, that can be controlled, for example, through the synthesis from organometallic compounds. The use of these precursors allows to work under mild reaction conditions.

In order to control the growth of nanoparticles we use different stabilizers like long alkyl-chain thiols or organic polymers. In this way we have obtained arranged silver nanoparticles forming nanocrystal super lattices (NCSs), or silver nanoparticles inserted in materials with possible applications, respectively.

When long alkyl-chain thiols are used as stabilizers against silver (I) organometallic precursors, polymeric sheets of [Ag(SR)] stoichiometry are formed. Decomposition of this already organized silver polymer allows a very good control over the nanoparticle growth leading to highly ordered nanocrystal superlattices (NCSs) using specific reaction conditions.

We have also used different polymers, like cellulose acetate or polyvinylpyrrolidone, as stabilizing agents in the reaction, obtaining in each case silver nanoparticles inserted in cellulose acetate films, highly homogeneous silver nanoparticles using ethylene glycol as solvent, and very small silver nanoparticles (2-3 nm) that have been coated with a silica shell.

References:

[1] Niemeyer, C. M, Angew. Chem. Int. Ed., **22** (2001) 4128-4158.
[2] Kamat, P. V.; Meisel D., Current Opinion in Colloid & Interface Science, **5-6** (2002) 282-287.

Figures:

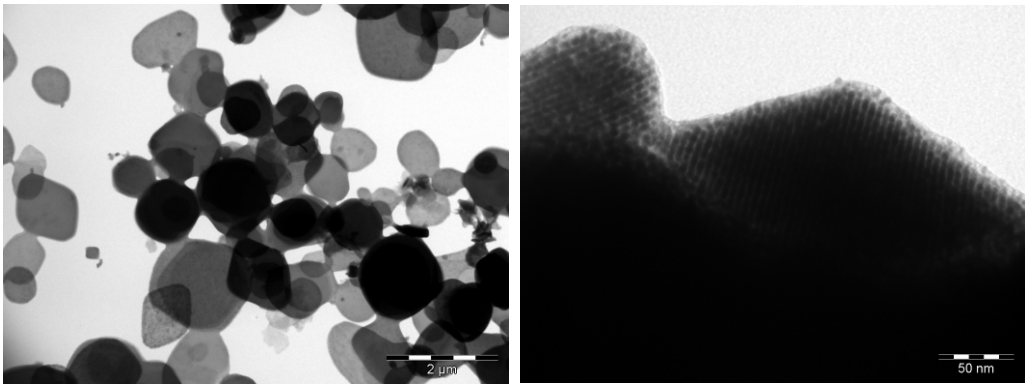

Figure 1. Silver nanoparticles obtained using hexadecanethiol as stabilizing agent.

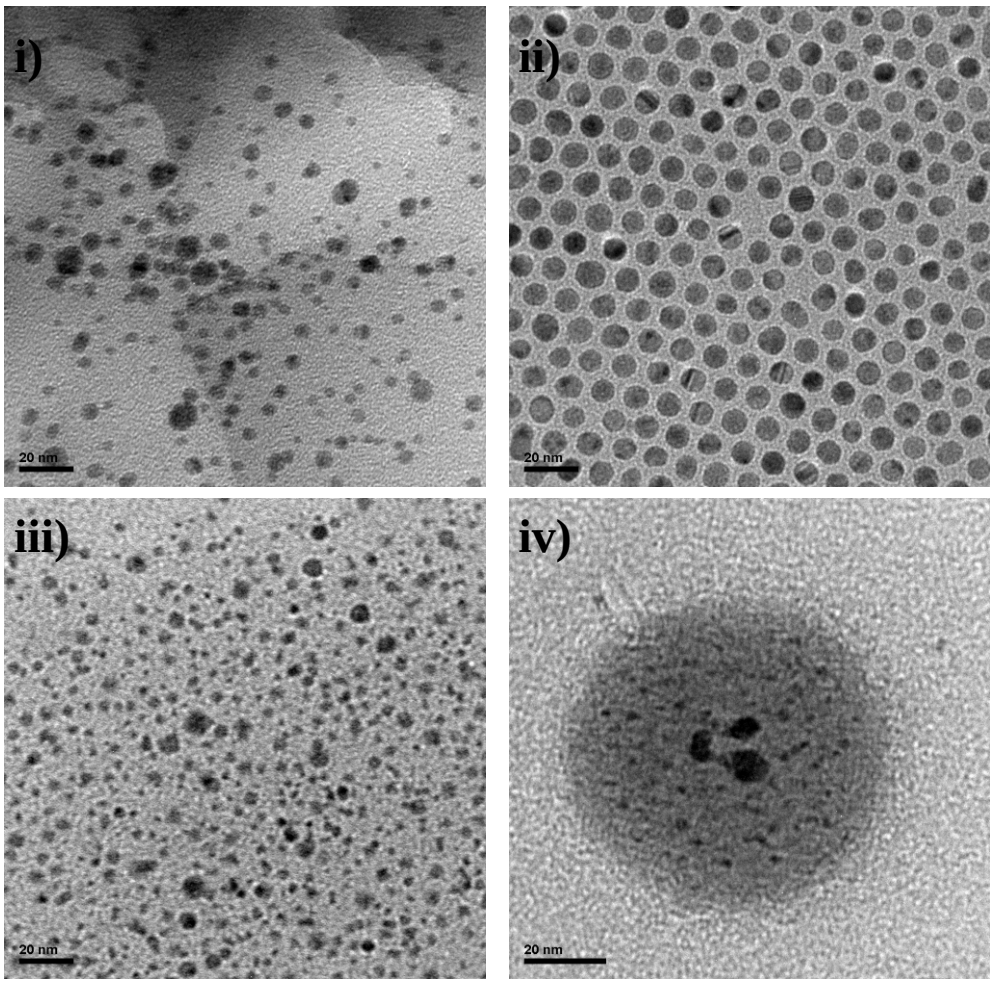

Figure 2. Silver nanoparticles obtained using i) cellulose acetate, ii) polyvinylpyrrolidone in ethylene glycol, and iii) polyvinylpyrrolidone as stabilizing agent, and iv) silver nanoparticles coated with a silica coating.