

Synthesis of gold and silver nanoparticles functionalized with organic dithiols

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Noble metal nanoparticles represent a very interesting class of materials thanks their unique chemical-physical properties conferred by their nanoscopic scale. In particular gold and silver nanoparticles are largely employed in biomedicine [1], catalysis [2] and optoelectronic [3] applications.

In this work three different bifunctional organic dithiol, the 4,4'-dithiol-biphenyl (BI), the 4,4''-dithiolterphenyl (TR) and the 4,4'-dithiol-*trans*-stilbene (ST), have been used for the stabilization of gold and silver nanoparticles (AuNPs and AgNPs). The ST ligand has been prepared by following a synthetic procedure developed in our laboratory [4] and has been carefully characterized. Then, gold and silver nanoparticles have been prepared by using a double phase reaction through the reduction of the metal precursor, the tetrachloro auric acid and the silver nitrate salt. The obtained NPs have been purified and then characterized with spectroscopic and microscopy techniques. The Uv-Vis investigation carried out on the NPs has showed the Plasmon resonance even if the peak was rather broad and red shifted respect the typical value (more than 550 nm for AuNPs and more than 450 nm for AgNPs) this could be an indication of the networks formation [5]. The PL studies have revealed the fluorescence properties of the NPs whereas the XPS measurement have confirmed the functionalization of the metal surface and has given information about the amount of thiol involved in the metal-sulfur bond. The morphological investigation carried out with the FESEM microscopy, revealed the presence of spherical NPs of less than 10 nm for gold and bigger for silver ones. In particular the FESEM images of the AuNPs stabilized with TR ligand have showed the most ordered arrangement in the space and also the XPS characterization has confirmed that is the system with the highest amount of thiolic functionality involved in the networks formation. So this last sample is the best candidates for the optoelectronic applications.

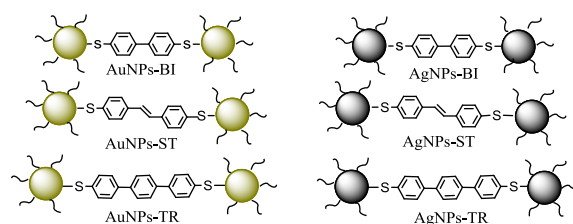


Figure 1 chemical sketch of the synthesized gold and silver nanoparticles functionalized with the organic dithiols: BI, TR and ST

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