In-situ photoinduced synthesis of bimetallic nanoparticles in acrylate polymers

Joachim Haemers, Jessica Plé, Emmanuel Le Bec, Hélène Lecoq, Dider Zanghi, Lavinia Balan*

[1]*Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI - UPR3079 CNRS), Orléans, 45100, France.*
*E-mail: lavinia.balan@cnrs-orleans.fr

Keywords: bimetallic nanoparticles, nanocomposites, photoinduced synthesis

Noble metal nanoparticles (MNPs), gold and silver, are sought after for their interesting properties in various fields such as optics, electronics, biomedical [1, 2]. Those properties are improved when the two metals are combined to form bimetallic nanoparticles, which can typically exhibit alloy or core-shell structures.

In our study, the MNPs are created within a polymer matrix, in order to obtain the bimetallic /polymer nanocomposites. A photo-induced synthesis allows the dual process of metal precursor photo-reduction and photo-polymerisation of acrylate monomers [3, 4]. Depending on the desired properties, it is possible to synthesis core@shell (Ag@Au or Au@Ag) or alloys NPs directly inside the polymer matrix. This photochemical approach is environment friendly, as it avoids the use of the toxic reducers or solvents and is carried out under air and at room temperature.

The nanocomposites were characterised by various techniques. Firstly, the nano-object formation was monitored *via* the localised surface plasmon band using a UV-Vis spectrometer, which also provides clues regarding the NPs shapes and sizes. X-ray photoelectron spectroscopy confirms the reduction of the metal precursors, while electron microscopies (SEM and TEM) and X-ray absorption spectroscopy, done at the Soleil synchrotron, help determine which kind of nanoparticles, core-shell or alloy, were obtained in the polymer matrix.

The developed nanomaterials could then be used in optical and biomedical applications such as smart plasmonic sensors or adaptable electronic components.

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