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Photo-design of metal/polymer nanomaterial and nanostructured materials

The size dependent properties of noble Metal Nanoparticles (MNPs) have created a great promise for their use in a variety of optical, electronic and biomedical applications. A great diversity of techniques and methods were developed for their synthesis: Chemical, thermal, photochemical or biological. Among them, photochemical approach has proved an excellent tool to synthesize nanoparticles and also nanocomposite materials as well in the investigation of the mechanistic aspects of their formation. In particular, present the advantages of a green and highly flexible character and a strong control in both spatial and temporal directions. In this context, firstly, we will use the photochemistry to generate MNPs through photo reduction of a metal precursor using free radicals generated from photosensitizers in an aqueous solution or directly generated onto a glass surfaces in order to produce plasmonic surfaces. Thus efficient nanoparticles synthesis and their morphological control require a careful selection of experimental conditions such as photonic and chemical parameters. Moreover, the photochemical tool was used not only to the nanoparticles synthesis but also to obtain advance nanomaterials as nanocomposites metal/polymer. The hybrid nanocomposites have been obtained by combing the *in situ* photoreduction of MNPs with the acrylates monomers photopolymerization. Specific interactions between the macromolecular network and the nascent particles was found to play an important role insofar as they control the access of metal atoms to the different crystalline planes of the growing nanoparticles which is necessary to obtain anisotropic objects. The assembling process of MNPs in the polymer matrix was the next step of our work. Controlling both the synthesis and multi-scale organization (nano, micro and macro) of such cross-linked organic-inorganic nanomaterial opens promising prospects in the field of advanced materials.

Biography

Lavinia Balan has received her PhD degree from the Henry Poincaré University in Nancy, France, in 2005. Her PhD was devoted to the elaboration of an original material for the anode of Li-ion batteries. After her Post-doctorate in Orleans and then in Mulhouse, she had joined the Department of Photochemistry (DPG) of Mulhouse in 2006 as a CNRS Senior Researcher. In 2009, she had joined the Institute of Materials Science of Mulhouse (IS2M) CNRS-UMR 7361. She has published more than 100 papers, 4 book chapters and held 5 EU patents. Her lines of research are concerned with photochemical synthesis of metal/polymer nanocomposites and design, customization and characterization of metal nanoparticles and nanocrystals (quantum dots) suited for advanced applications in the fields of optic, photonics, plasmonics, information storage, imaging or biology. She has also been serving as an Editorial Board Member for few scientific journals.

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