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Light-assisted synthesis of metal polymer nanomaterials: An efficient green approach to obtain smart materials



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Metal nanoparticles show potential applications in various fields including but not limited to medicine, catalysis, optics or electronics. Combining the intrinsic characteristics of metal nanoparticles with those of polymers opens up new vistas in the quest for materials with very innovative properties. In this context, metal/polymer nanocomposite materials were developed through a simple, rapid and green approach based on the photoreduction of a metal precursor and polymerization of a blend of monomers. Silver nanofilms were directly generated on a variety of substrates through this environmentally friendly approach, which uses a simple UV source does not involve any reducing or stabilizing agent and does not require any thermal activation. Top-coated films of unprotected silver nanoparticles were generated from a hydroalcoholic AgNO_3 solution or an acrylate monomer formulation, directly on glass substrates or food packaging plastic wraps. The metal nanoparticles and metal/polymer nanocomposites film obtained in this way were characterized and the influence of several parameters (fluence, exposure, silver ions concentration and nature of the free radicals generator) on their formation was evaluated. This photoinduced synthesis offers substantial advantages since it combines the characteristic features of light activation i.e. versatility and convenience of the process, high spatial resolution and reaction controllability (intensity and wavelength), with the simplicity of the colloidal approach. Moreover, the use of amplitude masks or interferometry devices to shape up the light beam used to induce the photoreduction of silver cations provides a very powerful and versatile means to spatially manipulate metal nanoparticles.

Biography

Lavinia Balan obtained her PhD degree from the University Henry Poincaré in Nancy, France (2005). Her PhD was devoted to the elaboration of an original material for the anode of Li-ion batteries. After a Post-doctorate in Orleans and then in Mulhouse, she joined the Department of Photochemistry (DPG) of Mulhouse in 2006, as a CNRS Senior Researcher. She opened a new field of research in this laboratory, viz. the photoassisted synthesis of metal nanoparticles and metal-polymer nanocomposite materials. Since December 2009, she joined the Institute of Materials Science of Mulhouse (IS2M) CNRS-UMR 7361. She has published more than 100 papers, four book chapters and five patents. She has been serving as an Editorial Board Member for few scientific journals.

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