Nekane Guarrotxena, Polym Sci, 3:3
DOI: 10.4172/2471-9935-C1-001

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Engineering "smart" nanohybrid materials: New polymeric strategies for NPs functionalization and their improved applications

The field of functional nanohybrid or nanocomposite materials is one of the most promising and rapidly emerging research areas in materials chemistry. These materials can be defined as synthetic organic-inorganic materials linked together at nanometer scale. The huge potential combinations of the distinct properties of inorganic and organic components in a single material have attracted considerable attention; and provide vast opportunities to develop novel advanced materials with well-controlled structures and multiple functions. On the one hand, the morphology- dependent tunable magnetic, optical, and electronic properties of inorganic nanoparticles (NPs) can be advantageous to many fields, such as optical and electronic materials, biomaterials, catalysis, sensing, coating, and energy storage. On the other hand, a smart-polymer is a high performance polymer which shows sensitiveness to temperature, humidity, stress, pH or an electrical/magnetic field and respond varying colour or transparency, becoming conductive or permeable to water, among other ways. Interestingly, in these materials slight changes in the environment induce large changes in the polymer´s properties; and consequently, the combination inorganic nanoparticles-stimuli-response polymers yields smart nanohybrids and nanocomposites with improved and even novel properties. However, despite the breadth of papers attesting the interest of the subject, the establishment of new and simple protocols for polymer-coating of inorganic NPs still remains a challenge. In fact, polymer-stabilized NPs in organic solvents offer a great chemical playground for directed self-assembly, by simply changing the composition of the solvent; which expands their potential applications. In this talk, we will highlight our recent development in the area of multifunctional organic-inorganic hybrid nanostructures, laying focus on the improved, optical and electronic properties of organic-inorganic nanomaterials as a response to chemical signals conversions derived from the impact of pH and temperature external stimuli. This research requires a good understanding of structure-property relationships that guide to new materials.

Biography

Nekane Guarrotxena is a PhD from the University of Complutense, Madrid-Spain and was a Post-doctoral Research at the Ecole Nationale Superieure d´Arts et Metiers (ENSAM), Paris-France and the University of Science II, Montpellier-France. She was the Vice-Director of the Institute of Polymer Science and Technology (ICTP-CSIC) (2001-2005) and Visiting Professor at University of California, Santa Barbara-USA and the CaSTL at University of California, Irvine-USA (2008-2011). She is currently the Research Scientist at ICTP-CSIC (Spain), Editorial Board Member of some Materials Science and Chemistry journals and External Expertise Consultant on I+D+I management Policy for National and International Agencies. Her research interest focuses on the synthesis and assembly of hybrid nanomaterials, nanoplasmonics, and their uses in nanobiotechnology applications (bio-imaging, drug delivery, therapy and bio-sensing).

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