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Building up smart optical "organic-inorganic" nanosystems

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The noticeable physicochemical properties of colloidal nanoparticles (NPs) have made this class of materials very promising for several applications in all nano-related fields (science, technology and medicine). These size- and shape- dependent tunable properties can also be tailored by surface modification, functionalization or hybridization with other nanomaterials and/or polymers for specific applications. Functionalization of inorganic nanoparticles with polymers and/or rationally designed molecules offers a pathway towards engineering responsive and multifunctional composite systems. Stimuli-responsive polymer materials respond in a dramatic way to very slight changes in their environment (stress, temperature, light, ionic strength, pH, humidity and electric or magnetic fields). So far, functional smart polymers are becoming increasingly straightforward to design and synthesize nanomaterials with a remarkable range of predictable responses and other properties. Additionally, the hybridization of NPs with stimuli responsive polymers control and stabilize their assembly, and in consequence, the symbiosis between both components (nanoparticles and wrapping polymers), can result in smart nanomaterials which combine, change or present novel properties from their individual systems. These materials are playing an increasingly relevant part in a wide range of applications, such as smart optical systems and devices, micro-electromechanical systems, coatings, biosensors and diagnostics. On the basis of the high interest within the scientific community, even when important research has been done along the last years on the polymer coating of NPs, the establishment of new protocols for their functionalization is still needed. This talk will highlight recent development in the area of multifunctional organic-inorganic hybrid nanostructures that are self-assembled from nanostructured building blocks, focusing on the improvement of nano-hybrids' optical responses depending on the impact of pH and temperature external stimuli.

Biography

Nekane Guarrotxena has done her PhD from the University of Complutense, Madrid-Spain and Post-doctoral Research from the Ecole Nationale Supérieure of Arts and Crafts (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 the University of California, Santa Barbara-USA and the CaSTL at University of California, Irvine-USA (2008-2011). She is currently a 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 nano biotechnology applications (bioimaging, drug delivery, therapy and biosensing).

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