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Nanohybrids based on multi-stimuli responsive polymers and inorganic nanoparticles: Design and functional properties

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The morphology-dependent tunable optical, magnetic, and electronic properties of inorganic nanoparticles (NPs) make them key building-blocks in nanomaterials science, opening interesting pathways to fundamental research, and technological applications (bio- and device-technology). By definition, a smart- or stimuli responsive- polymer is a high performance polymer that change according to the environment they are in. They can be sensitive to temperature, humidity, pH or an electrical or magnetic field and respond in various ways, like varying colour or transparency, becoming conductive or permeable to water, etc. And usually only slight changes in the environment are necessary to induce large changes in the polymer's properties. The combination between inorganic NPs and stimuli-response polymers yields smart nanohybrids and nanocomposites with improved and even novel properties, besides to stabilize and control their assembly. In this sense, 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. Despite the great interest in the scientific community, as reported by the wide literature on the subject, the establishment of new and simple protocols for polymer-coating of inorganic NPs is still needed. This talk will highlight recent development in the area of multifunctional organic-inorganic hybrid nanostructures, laying focus on the improved, optical response of nanohybrids depending on the impact of pH and temperature external stimuli. This research requires a good understanding of structure-property relationships that guide the design and generation of novel smart materials with well-controlled stimuli-responsive features for specific applications.

Biography

Nekane Guarrotxena has completed PhD from the University of Complutense, Madrid-Spain and Post-doctoral researcher at the Ecole Nationale Supérieure d'Arts et Métiers (ENSAM), Paris (France) and the University of Science et Technologie de Montpellier (France). From 2008-2011, she was visiting Professor in the Department of Chemistry, Biochemistry and Materials at the University of California, Santa Barbara (USA) and the CaSTL at the University of California, Irvine (USA). She is currently Research Scientist at the Institute of Polymer Science and Technology (ICTP), CSIC-Madrid (Spain). Her research interest focuses on the synthesis and assembly of hybrid nanomaterials, nanoplasmonics, and their uses in nanobiotechnology applications (bioimaging, biosensing, drug delivery and therapy).

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