“Customizing the Surface of Nano-objects for Engineering Hybrid Nanoparticles”

Presented by:

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Departmental Colloquium

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601 Old Chem
Mona Tréguer-Delapierre received her BS and PhD degrees in physical chemistry from the University of Orsay, South Paris. She has received an award from the Chancellerie des Universités de Paris for her PhD thesis. After a postdoctoral fellowship at the University of Notre Dame, Indiana (USA) with Dan Meisel, she joined the faculty in the Chemistry Department at the University of Bordeaux, in 2000. Pr. Treguer's research is centered on the fabrication of nanomaterials for catalysis, biology and optics. Her current interest involves the development of generalized strategies for the synthesis of new nanomaterials with controlled size, shape and composition. The nano-objects can consist of either a small (less than 10 atoms) or a large number of atoms (hundred of atoms). She wants to understand How does a nano-sized crystal grow in solution? What shapes can be formed? What properties do they have and why are they size-dependent? How can we engineer hybrid nanostructures (metal-metal, metal-dielectric, metal-semiconductor)? How can we control the location of one component in relationship to other component(s) in the nano-object? How can nanocrystals be used as building blocks to engineer novel materials? Though eminently fundamental, these researches are required for the design of nanomaterials with tailored properties that can be used for practical applications in the field of catalysis, optics and biology.

She has published 80 papers in international journals including Nature, Nanoletters, ACS Nano, Phys.Rev.Lett., Adv.Mat. She co-edited 3 book chapters and held 6 Patents. She is in charge of several lectures at the University of Bordeaux and the Graduate School of Chemistry, Biology and Physics of Bordeaux. The courses are mainly based on general and inorganic chemistry as well as the chemistry and the physics of nanomaterials. Since 2016, she is in charge of the Master of chemistry with Olivier Mondain-Monval.
Combining material components of different nature in the same nanoparticle is a new challenge in nanosciences and offers a wide range of new and largely unexplored possibilities for developing novel materials. In particular, proper design of the hybrid nanoparticle should permit a control over the interaction of the material components to combine different confinement-induced properties, create new ones or introduce new functionalization. In this presentation, I will focus on the synthetic route of metallo-dielectric components targeting photonic materials. I will show how to build stable and robust raspberry-like nanostructures with close-packed plasmonic satellites with high purity as well as their unusual optical properties. I will also demonstrate how to get control of positioning of each component with respect to the other by using the concept of patchy particles. The self-assembly of these elemental building units offers interesting possibilities to create complex supracolloids for optical metamaterials or for the ultrasensitive screening of analytical targets, such as those relevant to medical and environmental sciences.