Montserrat Gomez
Université de Toulouse, France

Metal-based nanoparticles in environmentally-friendly media: From design to synthesis

Metal-Based Nanoparticles (MNPs) have been largely studied in the last decades due to their distinctive properties, which found applications in several fields (microelectronics, medicine, catalysis). "Nanocatalysis" emerged as a new concept that combines both colloidal catalysis and catalysis based on engineered nano-objects, showing defined structures and composition. Like most MNPs, aggregation during the catalytic reaction can lead to structure modifications, precluding their unique properties and then the lack of the expected reactivity. A way to avoid these drawbacks is to use solid supports in order to immobilize the nanocatalysts, favoring their recycling, but adding plausible effects due to the metal-support interactions. With the aim of preserving the surface state, the immobilization of MNPs in a liquid phase has been considered. Besides environmentally friendly properties, glycerol is characterized by a complex supramolecular network, permitting to trap the catalyst and easily extract the organic products; the catalytic phase can be then recycled, obtaining metal-free target molecules. Our team has proved the glycerol ability for the synthesis of both mono- (Pd, Cu and Cu_2O, Ni) and bi-metallic nanoparticles (Pd/Cu), leading to stable colloidal catalytic solutions in the presence of polymers (such as PVP), phosphines and biomass-based stabilizers such as cinchona derivatives . In particular, bimetallic nanoparticles have opened new horizons in energy conversions and organic transformations, thanks to cooperative effects between the two counterparts, due to structure-reactivity relationships (alloy, core-shell, hetero-dimer…). In this lecture, an account of our work in this field will be presented, from the synthesis and full characterization of metal-based nanoparticles in different media (including glycerol and solid supports), to catalytic applications, with the final goal of obtaining target molecules of interest for the fine chemistry sector.

Biography: Montserrat Gómez received her Ph.D. from the University of Barcelona (UB, 1991) in organometallic chemistry and homogeneous catalysis. She carried out a post-doc in I. Tkatckenko's Group (Toulouse, 1992) and sabbatical stays in P.W.N.M. van Leeuwen (Amsterdam, 1998) and B. Chaudret (Toulouse, 2002) teams. During 1993-2004, she was Lecturer in the UB working on chiral ligand design and enantioselective catalysis. Since 2005, she is full Professor and group leader at the University of Toulouse 3-Paul Sabatier. Her current research work is focused on transition-metal catalyzed processes mainly using non-conventional solvents (ionic liquids, glycerol) and original supports (biochars, halloysites), covering polymetallic complexes and well-defined nanocatalysts for applications in synthesis.

gomez@chimie.ups-tlse.fr