第427回触媒科学研究所コロキウム

Rational design of metal nanoparticles: assemblies, ligand effects and application in catalysis

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創成科学研究棟3階セミナー室D
http://www.cat.hokudai.ac.jp/access.html

The control over the characteristics of metal nanoparticles (NP) is a key point in order to control their final properties. In many cases NP are stabilized by ligands, limiting their growth – i. e. determining their size and shape –, and keeping them well dispersed – i. e. avoiding their coalescence. These ligands are chemically bonded to the surface of the NP and can thus affect their behavior, for instance leading to the formation of networks finding interesting applications in sensors, or in catalysis, either by altering the properties of the metal or directly by blocking some of the metal sites. We have developed a family of hybrid materials, allowing obtaining from ultra-small Ru NP to ordered materials in a precise manner. Also, the control of the electronic properties of the ligands present on the surface allows to understand and modulate the activity and selectivity of metal NP used as catalysts. For instance, weak donor ligands promote the hydrogenation of nitrobenzene leading to a more active catalysts. Finally, ruthenium nanoparticles can be finely tuned by adding a second metal. These bimetallic nanoparticles have been successfully used as catalysts in the selective 5-hydroxymethylfurfural hydrogenation, which is a promising intermediate for the synthesis of a wide variety of chemicals and alternative fuels based on bio-refinery.

M. Rosa Axet did her PhD in Tarragona (Spain) with a thesis on chiral catalysis and nanocatalysis (Prof. Claver and Prof. Castillón). After a postdoctoral fellowship in Trieste (Prof. Milani), Toulouse (Dr. Chaudret and Dr. Philippot), and Paris (Dr. Amouri) she joined CNRS – France as an associate researcher at the Laboratoire de Chimie de Coordination in Toulouse, where she started her research activities focusing on nanocatalysis. Her current research activities include organometallic and nanomaterials chemistry areas, mainly for applications in catalysis. She is interested in the study of the structure-properties relationships in several nanomaterials including bimetallic, supported or shape-controlled nano-objects, with special attention to the effects of the stabilizing ligands of the nanoparticles on their properties. Awarded with EMERGENCE@international INC 2019, CNRS. Scientific record: 33 articles, 4 book chapters. ORCID 0000-0002-2483-1533.

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