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Reactivity of Organometallic Nanoparticles : Coupling Chemistry with Physics

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Short Biography



Bruno Chaudret, graduated from École Nationale Supérieure de Chimie de Paris in 1975. He received his Ph.D. from Imperial College London in 1977 with Sir Geoffrey Wilkinson and the degree of a "Docteur ès Sciences" at the University of Toulouse in 1979. He is now "Director of Research CNRS", Director of the "Laboratoire de Chimie de Coordination CNRS" in Toulouse and a member of the French Academy of Science.

He developed in the early 80s the synthesis of hydride and dihydrogen complexes and investigated by NMR their exchange processes which follow classical or quantum-mechanical pathways. These studies have been extended to the coordination of other simple groups such as C-H and Si-H, and led to a creative chemistry as well as to new catalytic processes.

In the early 90s, Bruno Chaudret developed an organometallic method for the synthesis of metal or metal oxide nanoparticles. The mild conditions used allowed the control of the particle size and size distribution together with that of the surface species present on the nanoparticles (hydrides, organic or inorganic molecules). The presence, dynamics and reactivity of these surface species has been monitored by various NMR techniques.

The particles exhibit physical properties, in particular magnetic properties, similar to those studied using high-vacuum methods. According to the reaction conditions, the particles adopt precise shapes (spheres, cubes, rods, wires, urchins, fractal structures) and may assemble into two- or three-dimensional super-crystals in which the particles diameters can vary between 1 and 15 nm. These new nano-objects display interesting properties in various domains such as catalysis (enantioselective), magnetism, optics, micro- and nanoelectronics.