

第488回触媒科学研究所コロキウム

Understanding Catalysis, one Atom at a Time

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Most efficient chemical processes used in industry rely on heterogeneous catalysis. While the search for more sustainable processes and the changes in environmental policies impose the continuous development of more efficient catalysts, we have currently little understanding of the structure of the actives in these processes. Hence, due to their inherent complexity, heterogeneous catalysts have been mostly developed empirically.

Here, we will show how constructing active sites, one atom at a time on surfaces, enables molecular-level understanding and implementation of rational approaches for the improvement of catalytic processes. We will first illustrate how this approach enables to generate selective single-site catalysts. We will next show how from these isolated (single) sites, one can generate and understand far more complex systems such as supported nanoparticles, where interfaces, alloying... play a critical role. This lecture will be developed around these themes and will show how the development of advanced characterization tools augmented by computational approaches can provide useful information to bridge the gap between fundamental and applied (industrial) catalysis.

Prof. Christophe Copéret (CCH) was trained in chemistry and chemical engineering at CPE Lyon, France, and carried out a PhD in chemistry with Prof. E. Negishi (Purdue University, USA – 1991–1996), where he investigated the synthesis of complex molecules via Pd-catalyzed carbonylation reactions. After a postdoctoral stay with Prof. K.B. Sharpless (Scripps), CCH was offered a research position at CNRS in 1998 and was promoted CNRS Research Director in 2008. Since 2010, CCH is Professor in the Department of Chemistry and Applied Biosciences, ETH Zürich. His scientific interest lies at the frontiers of molecular, material and surface chemistry as well as NMR spectroscopy with the aims to design molecularly-defined solid catalysts through detailed mechanistic studies and structure-activity relationships. CCH is the President of the Platform Chemistry of the Swiss Academy of Sciences (SCNat), a member of boards (Swiss Chemical Society and EuChemS) and advisory boards of numerous journals (Catal. Lett., Catal. Sci. & Eng., Chem. Sci., Helvetica, Topics Catal...). CCH is also Associate Editor for the Journal of the American Chemical Society. Besides his scientific activities, CCH enjoys literature, history, cooking and wine tasting, probably a reminiscence of his childhood spent in the vineyards in Fleurie (La Reine), one of the famous crûs of Beaujolais, just ca. 50 km North of Lyon.

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