Selective transformation of biomass in the presence of heterogeneous catalysts

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The significant climatic upheavals and the general deterioration of the environment must lead us to step back to evaluate the impact of our anthropogenic footprint and to find quickly alternatives to the productions of essential chemical compounds. In order to reduce greenhouse gas emissions, the conversion of biomass and the derived-platform molecules into synthons for fine chemistry or specialty chemical sectors is an alternative to fossil resource use.
The development of efficient catalysts within this area of research has evolved spectacularly since the beginning of the XXIst century. Significant progresses have been achieved leading to the development of highly active and selective heterogeneous catalysts. While in some applications, catalysts developed for transformation of petrochemicals may be used, in many cases, considering the chemical diversity of biomass derivatives, specific catalysts have to be developed. Indeed, aqueous-phase processing is a key issue since highly oxygenated compounds are concerned in the lignocellulosic biomass. To address this issue, the design of ideal catalysts as well as appropriate processes are world-wide studied.
We have developed a range of catalytic systems active in hydrogenation, hydrogenolysis, aerobic oxidation or dehydrogenation of oxygenated substrates issued from biomass. The nature of the support (mainly oxides), of the metal (rhodium, ruthenium, copper, molybdenum…) affected the performances of the catalysts but also the stability [1]. In addition, the influence of potential residues or impurities present in the raw feed has rarely been studied while there is a need to better understand their effect [2]. Applications covered fine chemicals (solvent, monomer or chemical intermediates) as well as hydrogen production [3].

References

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BIO

Dr Catherine Pinel is director of research and head of the Institute of Research on Catalysis and Environment in Lyon (IRCELYON). After her PhD in 1992 dealing with enantioselective hydrogenation with chiral ruthenium complexes under the supervision of Prof. J. P. Genet (Paris), she moved to Cambridge in the group of Prof. S. V. Ley where her postdoc was devoted to the synthesis of the C10−C17 fragment of Rapamycin. In1994, she joined the CNRS with a tenure position, and her research interests have been concentrated on the development of homogeneous and heterogeneous catalysts applied in fine chemistry. More specifically, she developed catalysts efficient in selective biomass transformation (mainly hydrogenation, hydrogenolysis or oxidation). In 2005, she was awarded by the French Division of Catalysis. She has co authored more than 160 scientific publications and a dozen of patents.