Role of heterogeneous catalysis in the biorefinery of wood into chemicals '

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Global feedstock supply is under pressure due to shortness and geopolitical issues. The current transition of feedstock implies a change from fossil oil into other resources like gas, coal and biomass. Strategies to convert each of them into chemicals and materials, and the different challenges associated with that goal, are different for each alternative feedstock. Biomass, when sustainably harvested, is considered renewable and may have the benefit of a low carbon footprint. As long as the atom economy of the reactions to convert biomass into chemicals is high, use of such renewables is an elegant solution to replace the fossil resources.

Reactivity of a molecule is largely determined by its chemical functional groups. Biomass compounds comprises a collection of beautiful chemical structures: alcohols and carbonyls in carbohydrates, amines and others in proteins, carboxylic acids and esters in triglycerides, aromatics in lignin and cyclic structures in terpenes. Next to technological challenges in the biorefinery, the emerging task of (bio)chemists is to uncover reaction pathways that selectivity convert the original structures into useful ones.

While biotechnology is able to deal with biomass feedstock, classic heterogeneous catalysis also will play a great role in that transformations. Even better, taking advantage of both worlds, joint conversions will likely be the best strategy in a biorefinery to produce a handful of chemicals against competitive prices. Since the beginning of the 21st century, a vast literature has developed showing elegant catalytic systems, adapted for the conversion of biomass. In this context, the lecture will give an overview of the catalytic work done in my group over the last couple of years. Key points of interest are the role of catalysis in the biorefinery of lignocellulosics with focus on the recovery of carbohydrate pulp and the lignin-derived chemicals, as well as their isolation and selective conversion into useful products and materials.