Prof. dr. Bert Sels
KU Leuven

Catalysis Connected

Title
Refining lignocellulose: introducing the lignin-first biorefinery concept

Abstract
The goal of a 'bio-refinery', in analogy to the petro-refinery, is to fractionate a raw renewable carbon resource into specific and purified product mixtures, creating valuable streams which can be processed further by the chemical industry. The most abundant and probably most promising sustainable resource is lignocellulose, which is the structural material of plant biomass. Many biorefinery schemes focus on (hemi)cellulose valorisation, while the complex lignin fraction is regarded as a waste product that can be implemented in low-value applications, but is mostly burned for energy recuperation. In pursuing more added value, the production of platform chemicals or fuels from lignin clearly remains one of the foremost challenges in current biomass conversion.
An alternative bio-refinery concept that recently receives increasing attention, is termed catalytic reductive fractionation (CRF).[1] During this process, woody or herbaceous biomass is processed at elevated temperatures (423 K – 523 K) in an organic solvent (*e.g.* methanol), in presence of a heterogeneous redox catalyst under hydrogen atmosphere. Lignin as present in the matrix is extracted through solvolysis and is simultaneously disassembled *via* hydrogenolysis. This results in a select number of phenolic monomers, dimers and short oligomers, together with a carbohydrate pulp, ready for further valorisation. In this contribution, we (i) present the concept in general and (ii) show a profound examination on the role of the catalyst,[2] the solvent,[3, 4] and acidic/alkaline additives.[5] Use of the phenolic compounds from the isolated lignin oil for the synthesis of chemicals and materials will be presented.

MCEC Netherlands Center for Multiscale Catalytic Energy Conversion

Advanced Research Center Chemical Building Blocks Consortium

DCS Dutch Catalysis Society