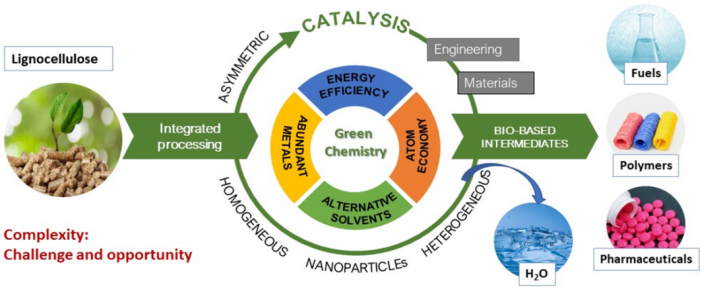
Embracing complexity in renewable resources: pathways towards bio-based products

Katalin Barta

University of Graz, Institute of Chemistry, Heinrichstraße 28, 8010 Graz, Austria
E-mail: katalin.barta@uni-graz.at; website: www.bartagroup.org

Lignocellulosic biomass is a carbon-neutral, non-edible feedstock that will undoubtedly serve as a sustainable raw material of the future decades [1]. To ensure its implementation, novel comprehensive and integrated biorefinery approaches and catalytic methods are necessary that are able to adapt to the increased structural complexity of these starting materials compared to petroleum, and - at the same time - comply with the principles of Green Chemistry [1,2]. In this lecture I would like to present the development of such integrated strategies, focusing on two key aspects: deconstruction/depolymerization of biomass (CLEAVE) [2-4] and functionalization of the obtained platform chemicals (COUPLE) via waste minimized approaches [5-7]. Focus is devoted to novel methods in lignin chemistry, especially with regard to obtaining well-defined aromatic platform chemicals by the stabilization of reactive intermediates through diol assisted fractionation (DAF) and reductive catalytic fractionation (RCF) pathways. This contribution will thus consider harnessing the inherent complexity of renewable resources for the development of novel catalytic processes – specially focusing on the conversion of lignocellulosic biomass to a range of specific and valuable products, such as fuels[3], polymers [6], fine chemical building block and biologically active compounds [5,7]



References:

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Prof. dr. Katalin Barta was born in Bratislava, Slovakia and completed her university studies in Hungary, and obtained her master's degree at the ELTE – Budapest, under the supervision of Prof. István T. Horváth. Next, she obtained her PhD in 2008 with Prof. Walter Leitner in homogeneous catalysis, at the RWTH-Aachen, Germany. She then carried out post-doctoral research in the group of Peter C. Ford at the University of California, Santa Barbara where she co-developed the conversion of lignin and lignocellulose in supercritical methanol using Cu-doped porous metal oxides. Then she moved to the Centre of Green Chemistry at Yale University to work with Paul T. Anastas on topics related the valorization of lignin to bio-derived platform chemicals. In 2013 she started as tenure track Assistant Professor at the Stratingh Institute, University of Groningen and was promoted to Associate professor in 2017. At 2019 she assumed her position as Full Professor at the University of Graz, Austria, where she leads the unit Renewable resources and Organic chemistry. Under the umbrella of sustainable catalysis, her research broadly focuses on green chemistry and alternative reaction media, with special attention to the valorisation of renewable resources to achieve more sustainable value chains and access specific bio-based products (biofuels, polymers, biologically active molecules, surfactants).

She is recipient of several prestigious grants such as the ERC Starting Grant 2015, the ERC Proof of Concept Grant 2019, the EIC Transition Grant 2021 as well as the ERC Consolidator Grant 2023. Her awards include the first NCCC (Netherlands Catalysis Conference) Award in 2019, the ACS Sustainable Chemistry and Engineering Lectureship Award in 2020 for her contributions to catalysis with renewable resources. Recently, she received the Styrian Innovation prize 2021 and the Phoenix Prize 2022 for her activities in the area of bio-based surfactants.

She is elected member of the Young Academy of Europe (YAE) and president of the EuChemSoc division of Green and Sustainable Chemistry and Chair of the Editorial board of ChemSusChem. She is in the advisory board of the journals ACS Sustainable Chemistry and Engineering and Chem Catalysis.