Elektrocheminės Medžiagotyros Seminaras

Blaž Likozar

National Institute of Chemistry (Ljubljana, Slovėnija)

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Engineering Catalytic Conversion Pathways of Lignocellulose to Functional Alcohol or Carboxylic Monomers

Efficient biomass fractionation provides qualitative streams which could be coverted into various value-added chemicals. Cellulose is a polysaccharide that can be hydrolzed into its monomers, i.e., glucose molecules. A very promising upgrading pathway targets the important polymer precursor adipic acid. Glucose is first oxidatively converted into aldaric acids, e.g. mucic acid, and subsequently fully dehydroxylated over supported Re catalysts. Combining dehydroxylation and Pt-catalyzed hydrogenation in a one-pot process, bio-based adipic acid is directly accessible.1 Alternatively, glucose can also be dehydrated to 5-hydroxymethylfurfural (5-HMF), a highly versatile bio-based platform chemical for bio-polymer and biofuel production. The diols 2,5-bishydroxymethalfuran (BHMF), and 2,5-bishydroxymethyltetrahydrofuran (BHMTF), and the triol, 12,6-hexanetriol (1,2,6-HT) are of particular interest. Catalytic hydrotreatment of 5-HMF has then been recognized as an effective conversion route to obtain these value-added chemicals from 5-HMF using nickel-based catalysts and high hydrogen pressures.2 Lignin is a natural polymer composed of aromatic monomeric units representing a renewable source for chemical production considering its aromatic, highly-functionalized structure and abundancy. Reductive depolymerisation is a promising method to convert lignin to aromatic monomers and oligomers. Thus, by mimicking the functional properties of the conventional toxic reactants (phenol, BPA) depolymerized products are successfully applied as green functional substitutes in polymers formulations.[3]

1. Hočevar, B.; Prašnikar, A.; Huš, M.; Grilc, M.; Likozar, B. Angew. Chemie - Int. Ed. 2021, 60 (3), 1244.

2. Pomeroy, B.; Grilc, M.; Gyergyek, S.; Likozar, B. Chem. Eng. J. 2021, 412, 127553.

3. Bjelić, A.; Likozar, B.; Grilc, M. Chem. Eng. J. 2020, 399, 125712.