Catalytic biomass valorisation to chemicals: an indispensable future direction

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Terrestrial biomass, especially lignocellulosic biomass, is an alternative to fossil fuels and an imperative, sustainable feedstock for producing valuable chemicals rather than fuels. On the one hand, fuels can be substituted with renewable energies, such as solar and wind, from a long-term perspective due to the steady decline of confined fossil resources. On the other hand, producing chemicals from any biomass becomes indispensable as there are no carbon sources. The transformation of biomass-derived substrates to chemicals by means of heterogenous catalysis is one of the appealing and intriguing approaches due to their wide array of inherent physico-chemical properties. Notably, zeolite- and metal oxide-based catalysts have been well-documented in the past decade due to their characteristic features, such as surface area, pore volume, pore size, adsorption/desorption, porosity, plane, exposure of active species, crystallinity/ amorphous, defective sites (oxygen vacancy/oxophilic sites). Biomass transformation generally entails a range of reactions such as oxidation, reduction, dehydration, isomerisation, hydrodeoxygenation and reductive amination to produce target chemicals in high yields.

This presentation focuses on the catalytic production of carboxylic acids/esters (e.g., lactic acid and 2,5-furandicarboxylic acid), ketoses (e.g., aldoses to ketoses), dehydration products (e.g., 5-hydroxymethyl furfural) amine via reductive amination (e.g., furfuryl amine) from biomass-based substrates. Importantly, how the characteristic features of the employed materials (zeolite- and metal oxide-based ones) play a key role in the transformation are discussed during the presentation [1-8].

References

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