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Catalytic deoxygenation: Industrial applications and catalysts

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Biomass is the most valuable renewable resource for the sustainable development of chemical industry, as it is the only renewable source of carbon. In contrast to the traditional carbon-containing fossil resources, biomass is rich in oxygen containing compounds. Consequently, there is a mismatch between the chemical compositions of the current products of the chemical industry and that of biomass. Catalytic deoxygenation is a key process to overcome this gap. Depending on the raw material composition, different catalytic deoxygenation strategy has to be selected. These can be classified as hydrogenation, decarboxylation or decarbonylation with water, CO_2 or CO, being the primary oxygen-containing product. In this regard, the conversion of triglycerides is an interesting example, as all three reaction pathways take place to a different extent under the deoxygenation conditions. In the first part, the presentation will briefly highlight the fundamentals of catalytic deoxygenation on the case study of triglycerides deoxygenation. In particular, it will look at different aspects of designing robust and efficient deoxygenation catalysts. The catalyst structure–activity and selectivity will be discussed and different possibilities to control hydrogen consumption during deoxygenation will be compared. In the second part, the alternatives of industrial implementation of catalytic deoxygenation within the existing infrastructure will be discussed from both automotive fuels as well as chemicals perspective. The last part will be focused on the potential application of HDO processes and catalysts for pyrolysis bio-oil upgrading.

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