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Editorial

Catalysis in Biomass Valorization—Preface to the Special Issue

Irinal L. Simakova [1] and Dmitry Yu. Murzin [2,*]

1 Boreskov Institute of Catalysis, 190013 St. Petersburg, Russia; simakova@catalysis.ru
2 Faculty of Science and Engineering, Åbo Akademi University, 20500 Turku, Finland
* Correspondence: dmitry.murzin@abo.fi

Biomass valorization has been the focus of substantial efforts in the industry and academia, addressing the issues of global warming and depletion of fossil resources. Catalysis is one of the most used tools in the implementation of sustainable catalytic technologies. In addition to the heterogeneous catalysts applied in oil refining and chemical industry, due to the type of feedstock applied in biorefinery, enzymatic and homogeneous acid catalysts are also utilized. The current short collection of papers devoted to catalysis in biomass valorization reflects both the nature of the feedstock and catalysts.

The entry point in biorefineries is the disassembly of lignocellulosic biomass, which can be achieved via high-temperature treatment (gasification, pyrolysis) or milder depolymerization in the presence of mineral acids. Lewandowska and co-workers (contribution 1) described the decomposition of woody and non-wood biomass catalyzed by mineral acids and intensified using microwave irradiation.

An alternative path for the hydrolysis of lignocellulosic biomass, including residues, is the use of enzymes. Belbahri and co-workers (contribution 2) described their efforts in the enzymatic engineering of cellulase, with the aim to improve enzyme stability.

The depolymerization of lignocellulosic biomass with subsequent fermentation results in the production of bioethanol, which has numerous applications in industry as a fuel or precursor of fuels and chemicals. A well-known reaction for the valorization of ethanol is aldol condensation (the Guerbet) reaction resulting in bio-butanol. Serwicka and co-authors (contribution 3) examined bio-derived ethanol oxidative coupling in the gas phase in multicomponent systems derived from hydrotalcite-containing precursors.

Microbial conversion of sugars, depending on the type of strain, allow for the production of butanediols, such as 2,3-butanediol, 1,4-butanediol and 1,3-butanediol. Furthermore, the transformation of diols through dehydration is a path for unsaturated olefin manufacturing. Sato and co-workers (contribution 4) developed the $Yb_2Zr_2O_7$ catalyst for the vapor-phase dehydration of 1,3-BDO.

Finally, Kaewkannetra and co-workers (contribution 5) reported a new application of biocomposite hydrogels, utilizing them as carriers for lipase entrapment during biodiesel production.

This short collection of articles reflects the diversity of challenges in the development of catalytic processes for biorefinery.

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List of Contributions

1. Kłosowski, G.; Mikulski, D.; Lewandowska, N. Microwave-assisted degradation of biomass with the use of acid catalysis. *Catalysts* **2020**, *10*, 641. https://doi.org/10.3390/catal10060641.
2. Balla, A.; Silini, A.; Cherif-Silini, H.; Bouket, A.C.; A.Boudechicha; Luptakova, L.; Alenezi, F.N.; Belbahri, L. Screening of cellulolytic bacteria from various ecosystems and their cellulases production under multi-stress conditions. *Catalysts* **2022**, *12*, 769. https://doi.org/10.3390/catal12070769.
3. Pieta, I.S.; Michalik, A.; Kraleva, E.; Mrdenovic, D.; Sek, A.; Wahaczyk, E.; Lewalska-Graczyk, A.; Krysa, M.; Sroka-Bartnicka, A.; Pieta, P.; Nowakowski, R.; Lew, A.; Serwicka, E.M. Bio-DEE synthesis and dehydrogenation coupling of bio-ethanol to bio-butanol over multicomponent mixed metal oxide catalysts. *Catalysts* **2021**, *11*, 660. https://doi.org/10.3390/catal11060660.
4. Matsuda, A.; Matsumura, Y.; Nakazono, K.; Sato, F.; Takahashi, R.; Yamada, Y.; Sato, S. Dehydration of biomass-derived butanediols over rare earth zirconate catalysts. *Catalysts* **2020**, *10*, 1392. https://doi.org/10.3390/catal10121392.
5. Muanruksa, P.; Dujjanutat, P.; Kaewkannetra, P. Entrapping immobilisation of lipase on biocomposite hydrogels toward for biodiesel production from waste frying acid oil. *Catalysts* **2020**, *10*, 834. https://doi.org/10.3390/catal10080834.