Heterogeneous Catalysis and Material Design across Disciplines and Value Chains

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The energy transition and the aim of a comprehensive circular economy pose numerous challenges for the transformation of chemical value chains. Material design and catalysis present key elements for valorizing renewable carbon resources such as biomass, CO_2 and even plastic waste potentially together with renewable energy. In particular, the interfaces of material design and heterogeneous catalysis with biotechnology, electrochemistry and process engineering offer opportunities for the design of efficient technologies.

Therein, the development of tailored solid catalysts for the selective transformation of biomass feedstocks will be discussed together with the potential of adsorbent design for separation in biorefinery [1,2]. Tackling CO_2 as future feedstocks, solid molecular catalysts, e.g. metal ions coordinated in N- or P-containing covalent framework materials, combine the advantages of homogeneous and heterogeneous catalysis [3,4]. Finally, electrochemical transformations of renewable carbon feedstocks facilitate integrating renewable electrical energy into chemical value chains [5].

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