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Biochemical processes of lignocellulosic biomass conversion

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In the face of a changing energy economy based on fossil fuels, we need to move towards renewable energy sources. And one such resource that meets these criteria is biomass. It is well known that in addition to thermochemical processes, biochemical methods of lignocellulosic biomass (LCB) processing play an important role in the production of renewable fuels and value-added products. Biochemical conversion involves the use of enzymes and microorganisms as catalysts in the breakdown of biomass into biofuels. The main biochemical conversion routes are anaerobic digestion (AD), fermentation, photobiological hydrogen production and bioelectrochemical processes that take place in microbial electrolysis cells (MEC). The biochemical route has a long cycle time and is less efficient at breaking down recalcitrant biomass materials. For this reason, a combination of thermochemical and biochemical routes may be promising, taking advantage of both methods for the processing of biofuels. But due to limited space this review is limited to the biochemical processes involved in biorefinery. After a brief characterization of lignocellulosic biomass (LCB) and the pretreatment techniques used to disrupt lignin structure, depolymerize cellulose, this review considers four main pathways for LCB biochemical conversion: Digestion (anaerobic); Fermentation (syngas, ethanol, butanol and dark fermentation); Photobiological hydrogen production; Bioelectrochemical processes in MEC. The integration of thermochemical processes with biological conversion of LCBs is an opportunity for further biorefinery development. Conclusions and future perspectives for the integration of biological and thermochemical LCB conversion processes are highlighted.

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