1. Record Nr. UNINA9910345962503321

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Titolo	Advancements in Biomass Recalcitrance: The Use of Lignin for the Production of Fuels and Chemicals
Pubbl/distr/stampa	Frontiers Media SA, 2019
Descrizione fisica	1 electronic resource (103 p.)
Collana	Frontiers Research Topics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia

Sommario/riassunto

Lignocellulosic biomass has great potentials as an alternative feedstock for fuels and chemicals. For effective utilization of biomass, biomass recalcitrance, which is inherent resistance of plant cell walls to biological deconstruction, needs to be reduced. Among many factors in biomass, lignin is significantly related to biomass recalcitrance. Lignin, a complex aromatic polymer, is the largest non-carbohydrate component (15-40% dry weight) in most terrestrial plants. In nature, it provides a structural integrity, facilitates water and nutrient transport, and protects plants from microbial attack. From a different angle, lignin significantly contributes to biomass recalcitrance, so it is necessary to reduce and/or modify the lignin for effective conversion of biomass. Genetic modifications of the lignin biosynthetic pathway and lignin-targeting pretreatments have been developed to minimize the lignin-induced biomass recalcitrance. High carbon content of lignin also renders it an attractive feedstock for many applications. About 100,000 to 200,000 tons of lignin can be generated per year as a byproduct from cellulosic ethanol production, so valorization of these lignins could be one of keys for achieving economic biorefinery. However, investigations of lignin conversion have not been accomplished as the utilization of carbohydrates in biomass. Depolymerization of lignin is still challenging because of its broad distribution of bond strengths, recondensation of low-molecular species, and poor product selectivity. Diverse biological and thermochemical depolymerization methods have

been investigated to overcome these barriers. In this Research Topic, recent advancements in biomass recalcitrance by effective utilization of lignin are introduced.