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Recent Progress in Bioconversion of Lignocellulosics

Recent Progreb In Bioconversion Of Lignocellulosics

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Recent Progress In Bioconversion Of Lignocellulosics:

Recent Progress in Bioconversion of Lignocellulosics George T. Tsao, 1999-09-02 This volume reports the latest advances in the science and technology related to the conversion of lignocellulosics. A portion of the volume is devoted to molecular biology of the enzymes and the microbes involved in the conversion. Hydrolysis of cellulose continues to be of prime importance in the overall conversion scheme. Reaction kinetics and mechanisms of cellulases as well as the state of the art methods of cellulase production by submerged fermentation and also by solid state fermentation are included in the volume. The latest advances made in dilute acid hydrolysis of cellulose are described. Finally some exciting methods and perspectives for bioconversion of lignocellulosics into ethanol, organic acids and other value added products are described. This volume should be useful to researchers in this area. It should also be helpful to those who want a concise overview of lignocellulosics. [Recent Progress in Bioconversion of Lignocellulosics](#) G. T. Tsao, 2014-01-15 **Bibliography of**

Agriculture, 1992 *Lignocellulose Bioconversion Through White Biotechnology* Anuj Kumar Chandel, 2022-09-05 Lignocellulose Bioconversion Through White Biotechnology Comprehensive resource summarizing the recent technological advancements in white biotechnology and biomass conversion into fuels, chemicals, food and more. Lignocellulose Bioconversion Through White Biotechnology presents cutting edge information on lignocellulose biomass conversion detailing how white biotechnology can develop sustainable biomass pretreatment methods, effective plant cell wall degrading enzymes to yield high quality cellulosic sugars and the eventual conversion of these sugars into fuels, chemicals and other materials. To provide comprehensive coverage of the subject, the work offers in depth critical analysis into both techno-economic and life cycle analysis of lignocellulose based products. Each of the 16 chapters, written by a well qualified and established researcher, academic or engineer, presents key information on a specific facet of lignocellulose based products. Topics covered include Lignocellulose feedstock availability, types of feedstock and potential crops that are of high interest to the industry. Lignocellulose bioconversion including both foundational technical aspects and new modern developments. Plant cell wall degrading enzymes including cellulase improvement and production challenges, solutions when scaling up. Improvements and challenges when considering fermenting microorganisms for cellulosic sugars utilization. Scaling up of lignocellulose conversion including insight into current challenges and future practices. Techno-economic aspects of lignocellulose feedstock conversion. Green consumerism and industrialization aspects of renewable fuels, chemicals. Students, academics, researchers, bio-business analysts and policy makers working on sustainable fuels, chemicals, materials and renewable fuels can use *Lignocellulose Bioconversion Through White Biotechnology* to gain invaluable expert insight into the subject, its current state of the art and potential exciting future avenues to explore. **Recent Advances in Bioconversion of Lignocellulose to Biofuels and Value Added Chemicals within the Biorefinery Concept** Edivaldo Ximenes Ferreira Filho, Leonora Rios de Souza Moreira, Eduardo de Aquino Ximenes, Cristiane Sanchez Farinas, 2020-05-07 Recent Advances in

Bioconversion of Lignocellulose to Biofuels and Value Added Chemicals within the Biorefinery Concept covers the latest developments on biorefineries along with their potential use for the transformation of residues into a broad range of more valuable products. Within this context the book discusses the enzymatic conversion process of lignocellulosic biomass to generate fuels and other products in a unified approach. It focuses on new approaches to increase enzymatic production by microorganisms, the action of microbial inhibitors and strategies for their removal. Furthermore, it outlines the benefits of this integrated approach for generating value added products and the benefits to social and economic aspects, circular bio economy, HUBs and perspectives. Covers the mechanisms of enzymatic conversion of biomass into value added products. Discusses bioproducts derived from lignocellulose and their applications. Includes discussions on design, development and the technologies needed for the sustainable manufacture of materials and chemicals. Offers a techno-economic evaluation of biorefineries for integrated sustainability assessments. Discusses the socioeconomic and cultural economic perspectives of the lignocellulosic biorefinery. Presents a virtual biorefinery as an integrated approach to evaluate the lignocellulose production chain.

Renewable Biofuels Vandana Rana, Diwakar Rana, 2016-12-08 This book offers a complete introduction for novices to understand key concepts of biocatalysis and how to produce in-house enzymes that can be used for low-cost biofuels production. The authors discuss the challenges involved in the commercialization of the biofuel industry given the expense of commercial enzymes used for lignocellulose conversion. They describe the limitations in the process such as complexity of lignocellulose structure, different microbial communities, actions and interactions for degrading the recalcitrant structure of lignocellulosic materials, hydrolysis mechanism and potential for bio-refinery. Readers will gain understanding of the key concepts of microbial catalysis of lignocellulosic biomass, process complexities and selection of microbes for catalysis or genetic engineering to improve the production of bioethanol or biofuel.

Lignocellulose Conversion Vincenza Faraco, 2013-06-12 Bioethanol has been recognized as a potential alternative to petroleum-derived transportation fuels. Even if cellulosic biomass is less expensive than corn and sugarcane, the higher costs for its conversion make the near-term price of cellulosic ethanol higher than that of corn ethanol and even more than that of sugarcane ethanol. Conventional process for bioethanol production from lignocellulose includes a chemical-physical pre-treatment of lignocellulose for lignin removal, mostly based on auto-hydrolysis and acid hydrolysis followed by saccharification of the free accessible cellulose portions of the biomass. The highest yields of fermentable sugars from cellulose portion are achieved by means of enzymatic hydrolysis, currently carried out using a mix of cellulases from the fungus *Trichoderma reesei*. Reduction of hemicellulases production costs is strongly required to increase competitiveness of second-generation bioethanol production. The final step is the fermentation of sugars obtained from saccharification, typically performed by the yeast *Saccharomyces cerevisiae*. The current process is optimized for 6-carbon sugars fermentation since most of yeasts cannot ferment 5-carbon sugars. Thus, research is aimed at exploring new engineered yeasts' abilities to co-ferment 5 and 6-carbon sugars. Among the main routes to

advance cellulosic ethanol consolidate bio processing namely direct conversion of biomass into ethanol by a genetically modified microbes holds tremendous potential to reduce ethanol production costs Finally the use of all the components of lignocellulose to produce a large spectra of biobased products is another challenge for further improving competitiveness of second generation bioethanol production developing a biorefinery

Bioconversion of Lignocellulosic Materials to Ethanol, 1989* **Bioconversion of Lignocellulosic Material** Warwick Lloyd Marsden, 1983 **Lignocellulose Biotechnology** Ramesh Chander Kuhad, Ajay Singh, 2007 The agricultural and forestry processing wastes lignocellulosics are an important material resource and energy source However if untreated they can pose a danger to the environment and potentially valuable resources Microorganisms contribute significantly to solving the problem of biomass degradation its recycling and conservation In the recent years an increasing interest shown by the textile food feed pulp and paper industries in the microbial and enzymatic processes has triggered in depth studies of lignocellulolytic microorganisms and their enzymes Moreover the advent of recombinant DNA technology in the late 1970s further paved the way for developing technologies based on lignocellulolytic microbes and enzymes Lignocellulose Biotechnology presents a comprehensive review of the research directed towards environmentally friendly agricultural and forest by products The book comprises 22 chapters divided in four sections It deals with a wide range of topics including biodiversity of lignocellulose degrading microorganisms and their enzymes molecular biology of biodegradation of lignin characterization of lignocellulolytic enzymes bioconversion of plant biomass to produce enzymes animal feed bioethanol and industrial applications of lignocellulolytic enzymes The chapters dealing with industrial applications also address current biotechnological approaches in lignocellulose bioconversion to value added products This book is essential for students researchers scientists and engineers working in the fields of environmental microbiology environmental biotechnology life sciences waste management and biomaterials

Bioconversion of Lignocellulosic Biomass to Microbial Lipids Zening Wang, 2018 Computer Conference on Bioconversion of Lignocellulosics for Fuel, Fodder and Food International Development Research Centre (Canada), 1983

Microbial Utilization and Bioconversion of Lignocellulosic Hydrolysates Yan Wang, 2021 *Bioconversion of Lignocellulosics Through SSF-ENLAC Process Using Hydrolytic Enzymes* Sawant Sharmila Vishnu, 2002 **Bioconversion of Heterogeneous Lignocellulosic Biomass for Sugar Production** Rodrigo Morales Vera, 2015 In order to accomplish large scale utilization of lignocellulosic feedstocks to produce fuels and chemicals a consistent inexpensive and stable supply of biomass from a variety of sources will be required These biomass will be heterogeneous and will change as a function of time and price and will most likely be available to the biorefinery in a mixed input stream with diverse physico chemical properties Consequently a potential biomass processing facility must be able to convert these diverse feedstock without significantly altering the overall performance sugar yields and fuel production Currently most bioconversion research has been carried out with high quality raw material such as clean wood chips and agricultural residues and little attention has

been paid to the efficiency of converting diverse feedstocks into fermentable sugars and fuels. Since particle size reduction is expensive and energy intensive but a critical operation for preparing the biomass for pretreatment, initial particle size heterogeneity was studied during the bioconversion of hybrid poplar. Different particle sizes ranging from 0.2x0.2 cm to 2.0x1.5 cm plus an equal mixture of all the particles were used to determine the influence of initial particle size heterogeneity during sugar production of hybrid poplar HP via bioconversion. It was found that there is essentially no effect of particle size heterogeneity on saccharification after steam pretreatment. The overall sugar recovery from all the samples ranged from 87.90% and 61.64% for glucose and xylose respectively and was not influenced by particle size. Alongside showing that bioconversion of HP managed different particle sizes and considering the availability of wheat straw WS as potential feedstock for a biorefinery, the influence of mixing these two feedstocks during the bioconversion for sugar production were investigated. Despite that raw HP and WS have different physico-chemical properties, mixing both types of biomass positively affects the bioconversion process. In fact, mixed biomass exhibited on average 20% more sugar production than either single biomass. Since it was shown that is technically feasible, the utilization of different combinations of HP and WS as a feedstock for sugar production, a techno-economic analysis was performed to determine and compare the economic feasibility of processing simultaneously mixed biomass HP and WS vs using single HP and WS in a campaign processing plan for ethanol production. The ethanol yields from process simulations estimated that mixed biomass yield 10 more gallons of ethanol per ton of biomass than using single HP and WS in a campaign system. Mixed biomass generate almost twice as much income per year than using single biomass in campaign plan processing, which is equivalent to extra 13.5 million per year. Techno-economic analysis indicated that production of ethanol using mixed biomass is more competitive vs using single HP and WS in campaign design processing to ethanol production.

Studies on Bioconversion of Lignocellulosics Into Enriched Animal Feed Using SSF-ENLAC Technology A. K. Puniya, 1993

Bioconversion of Lignocellulosic Materials to Fuels and Chemicals ACS. Biotechnology Secretariat, ACS. Cellulose, Paper and Textile Division, **Bioconversion of Lignocellulosic By-products to L(+)-lactic Acid by Lactobacillus Cultures** Shengde Zhou, 1997

Use of Process Design and Metabolic Engineering to Enhance Bioconversion of Lignocellulosic Biomass and Glycerol to Biofuels Chidozie Victor Agu, 2016

Recent efforts to reduce dependency on food based substrates for industrial applications aim towards the use of inexpensive and readily available non food based substrates such as lignocellulosic biomass LB and biodiesel derived glycerol. Interestingly, the utilization of lignocellulosic sugars for biofuel production is contingent on the disruption of recalcitrant LB cell wall structure prior to enzyme hydrolysis. Disruption and hydrolysis processes generate lignocellulose derived microbial inhibitory compounds LDMIC including acids, aldehydes and phenolics. Additionally, fermentation of glycerol to butanol, a next generation biofuel, is hampered by the inability of *Clostridium beijerinckii* NCIMB 8052, a butanol fermentation workhorse, to efficiently metabolize glycerol. Therefore, this study investigated novel strategies

for enhancing butanol and ethanol production through process design and metabolic engineering Towards process design the bacterium *Cupriavidus basilensis* ATCC BAA 699 was used to detoxify 98% of the LDMIC present in acid pretreated *Miscanthus giganteus* MG lignocellulosic biomass hydrolysates Fermentation of the detoxified MG hydrolysates by *C. beijerinckii* resulted in 70% 50% and 73% improvement in acetone butanol ethanol ABE concentration yield and productivity respectively when compared to the fermentation of undetoxified MG hydrolysates The second objective was to explore metabolic engineering strategies to enhance glycerol utilization by *C. beijerinckii* and improve butanol production in the presence of LDMIC To realize this objective genes that encode glycerol dehydrogenases *Gldh* and dihydroxyacetone kinase *Dhak* in a hyper glycerol utilizing bacterium *Clostridium pasteurianum* ATCC 6013 were systematically cloned into *C. beijerinckii* By over expressing two *C. pasteurianum* *Gldh* genes *dhaD1* *gldA1* as a fusion protein in *C. beijerinckii* we achieved 50% increase in cell growth ABE production up to 40% and enhanced rate of furfural detoxification up to 68% during the fermentation of furfural challenged 4 to 6 g L glucose glycerol medium Further co expression of *dhaD1* *gldA1* resulted in significant payoff in cell growth 57% glycerol consumption 14% and ABE productivity 27 3% compared to over expression of a single *Gldh* In parallel while co expression of *dhak* and *gldA1* in *C. beijerinckii* improved glycerol consumption by 37% relative to the plasmid control over expression of all three genes *dhaD1* *gldA1* *dhak* improved butanol production by 50% in the presence of 5 and 6 g L furfural relative to the plasmid control Objective 3 aimed to develop a high throughput alcohol dehydrogenase ADH dependent assay for screening hyper or hypo butanol producing *C. beijerinckii* mutant libraries Screening of the activities of ADHs from different microorganisms showed that *Thermotoga hypogea* derived ADH has 7 fold activity towards butanol than ethanol It was rationalized that *T. hypogea* ADH can be used to selectively quantify butanol in the presence of ethanol e g in ABE broth Objective 4 aimed to use allopurinol to inhibit xanthine dehydrogenase oxidase and improve ethanol fermentation of LB hydrolysates by *Saccharomyces cerevisiae* Allopurinol increased *S. cerevisiae* growth 19% ethanol titer 21% ethanol productivity 20% ethanol yield 24% and the chronological lifespan of *S. cerevisiae* 16 h during the fermentation of 100% corn stover hydrolysate Taken together this study encompasses novel strategies to enhance LB and glycerol utilization and potentially improve the economics of biobutanol and bioethanol production **Membrane**

Technology in the Bioconversion of Lignocellulosic Materials Ingrid Frennesson, 1984

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