Editorial
Volume 11:S6, 2021

Journal of Bioprocessing & Biotechniques

ISSN: 2155-9821 Open Access

Bioprocess Modelling on Lignocellulosic Biomass

Chunbo Liu*

Department of Science, University of Western Australia, Stirling Highway Crawley, Australia

Description

Lignocellulosic biomasses , which are currently unused, can be used to manufacture biofuels like ethanol along with bio refinery applications to manufacture a number of value-added goods. Although lignocellulose bioconversion by microbial or yeast fermentation has been documented, designing an efficient and cost-effective lignocellulosic fermentation process remains a problem due to the numerous process factors involved in bioprocess design, optimization, and scale-up. Bioprocess modeling techniques have been shown to be effective in achieving high yield, productivity, or titer of specific product efficiency in high-production mechanisms. Several types of lignocellulosic bioprocess modeling have been created and effectively verified as a potential choice for design process, optimization, and scaling up biomass-based procedures. The goal is to describe the significant advancements in bioprocess modelling for lignocellulosic bioprocess applications that have contributed to the success of biorefineries and the bio-based economy.

We explore modelling for lignocellulosic bioprocesses in particular, such as cell modelling based on kinetics, stoichiometry, and integrative techniques, as well as fermentation kinetic modelling for process performance assessment. This topic provides a brief of these modelling approaches and how they might be used to develop efficient and cost-effective lignocellulose-based bioprocesses.

Low-cost, accessible, and renewable lignocellulosic biomass has emerged as a viable alternative to corn and starch as a fermentation feedstock for bio-based products. Agricultural, industrial, and municipal solid wastes, as well as forestry residues, can be used to make these substrates. The utilisation of lignocellulose resources for the production of bio-chemicals and biofuels is thought to be both cost-effective and environmentally friendly. Several biotech organizations and pilot plants in Europe and the United States are rapidly optimising technology and scaling up for lignocellulosic bioprocesses. The degradation of lignocellulosic biomass to yield monomeric sugars for the fermentation step is necessary for bioconversion of lignocellulose to bio-products. The pretreatment of lignocellulose with thermal and/or chemicals, followed by enzyme hydrolysis, is by far the most common technique of lignocellulose hydrolysis. Many studies have shown that lignocellulosic feedstock can be used to produce bio-products by bacteria (e.g. *Zymomonas mobilis, Escherichia coli) and yeasts (e.g., Saccharomyces cerevisiae and Scheffersomyces stipitis).*

We look at modelling for lignocellulosic bioprocesses in particular, including cell modelling using kinetics, stoichiometry, and integrative approaches, as well as fermentation kinetic modelling for process performance analysis. This section gives an overview of various modelling approaches and how they might be utilized to the development of more efficient and cost-effective lignocellulose-based bioprocesses.

The existence of a sugar compound (primarily glucose and xylose) generated during the pretreatment and enzyme hydrolysis of lignocellulosic materials is one of the difficulties of lignocellulose fermentation. These sugars must be efficiently fermented by organisms into the desired output from an economical perspective. The fluctuation of sugar composition in different biomass feedstocks, 30-50% and 10-25% of dry weight for glucose and xylose content, respectively, does have a massive effect on fermentation performance since an organism may not be able to adjust its fermentation capacity optimally to match the change in sugar composition, resulting in a long fermentation time. To meet the technical and economic requirements of an industrial lignocellulose-based process, a culture system that really can withstand changes in sugar composition and efficiently ferment the sugar mixture is required.

Another complication with lignocellulosic fermentation is the presence of inhibitory compounds (such as acetic acid and furans) produced during pretreatment that effectively restrict the fermenting organism's development and fermentation effectiveness. These inhibitors are substantial obstacles to large-scale lignocellulose-based bioprocess adoption. The requirement of eliminating inhibitors by physical and chemical techniques is high, and it results in a loss off. To enhance process efficiency, inhibitor-tolerant micro-organisms should be included in the fermentation or an optimized process configuration may be used to avoid inhibitory effects.

The development of an inhibitor-tolerant cell factory is elucidating the mechanisms of known inhibitors, as well as metabolic and evolutionary engineering methodologies for developing threshold strains. As an outcome, this focuses on fermentation process configuration to address inhibitor and fermentative end product inhibition problems. Furthermore, difficulties with Lignocellulosic biomass viscosity and partial insolubility might result in poor mixing

***Address to Correspondence:** Chunbo Liu, Department of Science, University of Western Australia, Stirling Highway Crawley, Australia, E-mail: l.chunbo@yahoo.com.au*

Received: December 08, 2021; **Accepted**: December 22, 2021; **Published**: December 29, 2021

and limited mass and heat transmission, especially when the fermentation process is performed at a high solids level. To boost process efficiency, a fed-batch process configuration with proper mixing must be designed.

How to cite this article: Liu, Chunbo. "Bioprocess Modelling on Lignocellulosic Biomass." *J Bioprocess Biotech* S6 (2021) : e001.