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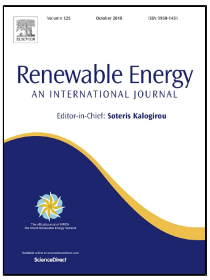

Key issues in modeling and optimization of lignocellulosic biomass fermentative conversion to gaseous biofuels

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Key issues in modeling and optimization of lignocellulosic biomass fermentative conversion to gaseous biofuels

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Abstract

The industrial-scale production of lignocellulosic-based biofuels from biomass is expected to benefit society and the environment. The main pathways of residues processing include advanced hydrolysis and fermentation, pyrolysis, gasification, chemical synthesis and biological processes. The products of such treatment are second generation biofuels. The degree of fermentation of organic substances depends primarily on their composition and chemical structure. Optimization of fermentation conditions leads to better understanding of occurring processes. Therefore, an overview of recent developments in fermentation modeling is necessary to establish process parameters enabling high yields of biofuels production. Among process parameters affecting the yield and rate of biogas and biohydrogen, pH of the pulp, temperature, composition, biomass pre-treatment and digestion time are to be considered. The technology of anaerobic co-digestion has been intensively developed as a valuable solution for the disposal of organic wastes and sewage sludge. Modeling of biogas production from lignocellulosic biomass has been intensively investigated and is well described by adapted ADM1 model. Modeling of fermentative hydrogen production lacks a kinetic model incorporating process parameters with the view of pretreatment and fermentation. This paper presents the state-of-the-art on the problems related to lignocellulosic biomass pre-treatment and discusses the mechanisms of lignocellulosics conversion to gaseous biofuels.

Keywords: *lignocellulosic biomass, biomass conversion, biogas, biohydrogen, kinetic models, empirical models*