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Exergy analysis of thermochemical and biochemical pathways for bioethanol production

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Future biomass conversion systems have to be developed using advanced conversion routes in order to compete with fossil fuels. An attractive biomass feedstock for bioethanol production is lignocellulosic biomass, particularly various agricultural and forest residues, such as sugarcane bagasse, which are available in large amounts. Lignocellulosic biomass can be converted into bioethanol using biochemical route, including pretreatment processes followed by hydrolysis of cellulose and hemicellulose into sugars and their subsequent fermentation. On the other hand, the thermochemical route can also be applied to bioethanol production, in which biomass gasification represents a pathway for the production of variety of biofuels, including ethanol, methanol, dimethyl ether, Fischer-Tropsch (F-T) fuels, hydrogen and Synthetic Natural Gas (SNG). However, although biochemical or thermochemical routes are promising technological options due to their large-scale production of lignocellulosic ethanol, they are still to be further developed to achieve commercial outcomes. In this work, a detailed exergy analysis of the biochemical and thermochemical conversion routes for bioethanol production from sugarcane bagasse is presented. In addition, a performance comparison in terms of exergy efficiency and destroyed exergy rate of each stage involved in these routes is determined. Hence, in an effort to compare these technological routes, the simulation processes were performed using Aspen Plus® software to a plant with 500 t/h milling capacity.

Biography

Pablo A. Silva Ortiz has a BS in Energy Engineering from the Universidad Autónoma de Bucaramanga-UNAB (2006) in Colombia. He also has an MS in Mechanical Engineering from the Universidade Federal de Itajubá-UNIFEI (2011) in Brazil. Currently, he is pursuing PhD in Mechanical Engineering at the Universidade de São Paulo-USP in Brazil. He is working on the research project entitled "*Exergy and environmental ranking of bioethanol production routes*".

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