World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:13, No:11, 2019

Kinetic Studies of Bioethanol Production from Salt-Pretreated Sugarcane Leaves

Authors : Preshanthan Moodley, E. B. Gueguim Kana

Abstract : This study examines the kinetics of S. cerevisiae BY4743 growth and bioethanol production from sugarcane leaf waste (SLW), utilizing two different optimized pretreatment regimes; under two fermentation modes: steam salt-alkali filtered enzymatic hydrolysate (SSA-F), steam salt-alkali unfiltered (SSA-U), microwave salt-alkali filtered (MSA-F) and microwave salt-alkali unfiltered (MSA-U). The kinetic coefficients were determined by fitting the Monod, modified Gompertz, and logistic models to the experimental data with high coefficients of determination $R^2 > 0.97$. A maximum specific growth rate (μ_{max}) of 0.153 h^{-1} was obtained under SSA-F and SSA-U whereas, 0.150 h^{-1} was observed with MSA-F and MSA-U. SSA-U gave a potential maximum bioethanol concentration (P_m) of 31.06 g/L compared to 30.49, 23.26 and 21.79g/L for SSA-F, MSA-F and MSA-U respectively. An insignificant difference was observed in the μmax and Pm for the filtered and unfiltered enzymatic hydrolysate for both SSA and MSA pretreatments, thus potentially reducing a unit operation. These findings provide significant insights for process scale up.

Keywords : lignocellulosic bioethanol, microwave pretreatment, sugarcane leaves, kinetics
Conference Title : ICBETCSGC 2019 : International Conference on Biomass Energy Technologies, Combustion Systems and Gasification Systems
Conference Location : Venice, Italy
Conference Dates : November 12-13, 2019