Journal of Chemical Engineering, IEB Vol. ChE 27, No. 2, December, 2012

Enzymatic Hydrolysis of Rice Straw to Fermentable Sugar: Kinetic Study

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Abstract

As the gradual up-growing trend of industrialization and urbanization leading steady increment of demand of energy; eco-friendly, bio degradable, cost competitive and promising source of energy with high sustainability is toughly needed for the new era of modern world. Hydrolysis of cellulose by cellulase enzymes is a vital candidate for this option. It is a solid-liquid heterogeneous reaction; strongly affected by the non-reaction resistances caused most notably by the crystalline structure; reaction environment parameters as temperature, pH, characteristics of enzyme, cell & substrate loading and hence must have to be defined for specific enzyme-substrate amalgamation. In this present investigation, glucose was produced from rice straw using cellulytic enzyme ***pseudomonas sp.***, isolated from municipal solid waste. Glucose yield was found to increase as the rice straw particle size decreased from 0.5 mm to 45 µm, while the optimal temperature and pH were found within the range of 30°C and 7.0 respectively. The concentration and rate of glucose production was observed to depend on pretreatment of rice straw, substrate concentration and enzyme loading. A kinetic model rate expression has been developed for such a process based on the Michaelis – Mentens and Line weaver–Burk approach. Comparison between the experimental data and those predicted from the rate model indicate good agreement with a mean absolute deviation of about 0.304916.

Keywords: Hydrolysis, Rice Straw, ***pseudomonas sp.,*** Michaelis – Mentens, kinetic model

DOI: 10.3329/jce.v27i2.17778