Optimization of the Enzymatic Saccharification Process Condition of the Enzymatic Pretreated Sawdust

Shah Samiur Rashid[1, a)], Amani M. Hashabra[1], Essam A. Makky[1], Dr. Aizi Nor Mazila Binti Ramli[1], Jalal K C A [2], Shaheen M. Sarkar [3]

[1]*Faculty of Industrial Sciences & Technology, University Malaysia Pahang, Gambang, Pahang, Malaysia*
[2]*Kulliyyah of Science, International Islamic University Malaysia, Kuantan, Malaysia*
[3]*Bernal Institute, Department of Chemical Sciences, University of Limerick, Castletroy, Limerick, Ireland*

[a)]Corresponding author: samiur@ump.edu.my

Abstract. The saccharification of laccase-pretreated sawdust was optimized using one-factor-at-a-time (OFAT) and response surface methodology (RSM). OFAT was used to investigate four (4) important parameters and it showed that the enzyme pretreated sawdust was best saccharified at the following conditions: cellulase concentration of 30 IU/g of sawdust, substrate concentration of 5.0% w/v, 50 °C, saccharification time of 36 h, and pH 5 where higher yield of sugar was obtained. Based on the OFAT result and previous studies three parameters such as saccharification period, pH and temperature were further optimized statistically using FCCCD (face centered central composite design) of the RSM. The ANOVA (Analysis of Variance) results from the RSM study explained significant probability of interaction of the studied parameters on the saccharification conditions ($p<0.05$). The model F-value (160.56) and p-value (<0.0001) implies significance of the studied RSM model. The developed model from RSM study was further validated. Therefore, the optimal saccharification condition was obtained using 5% of the laccase-pretreated sawdust, cellulase enzyme concentration of 30 IU/g, pH 5 at 50°C which yielded a maximum reducing sugar of 4.5 mg/ml after 36 h of saccharification.

Keywords— RSM, saccharification, FCCCD, enzyme, sugar