PHYSICAL PRETREATMENT OF LIGNOCELLULOSIC BIOMASS FOR UTILIZING ENVIRONMENTAL WASTE TO PRODUCE BIOFUEL

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Enzymatic saccharifiation of lignocellulosic biomass is low efficient process due to the recalcitrance of the biomass. Lignocellulosic biomass is composed of three major components; cellulose, hemicellulose and lignin, and cellulose is mainly used for producing fermentable sugar. However, cellulose is recalcitrant to enzymatic saccharification due to its highly crystalline structure. Furthermore, cellulose is structurally connected with lignin, which is a hindrant for cellulase accessibility. To solve these limitation, enzymatic saccharification process was combined with mechanical ball mill process. Mechanical ball mill process was effective for reducing biomass size and crystallinity, which ultimately improved digestability of cellulose. In this study, the effect of mechanical ball mill process on cellulase activity was investigated. By combining mechanical ball mill process, glucose conversion was obtained maximumly84.02%. The production of soluble phenolic compounds was only 0.072 ±0.003 g/L. Enzymatic saccharification was very fast and about 80% of process was completed within 24 hr after combining ball mill process. Typically, as increasing milling time, enzymatic saccharification process showed two different results depending on morphological change of biomass particles. As increasing milling time, biomass particles were crushed and, furthermore, formed increased surface area. In this case, the production of fermentable sugar by enzymatic saccharification was improved as increasing milling time. In the other case, biomass particles were crused and changed to small fragments as increasing milling time. However, the small fragments of biomass started agglomerating each other over certain time and form increased size of agglomeration. Therefore, sugar production is decreased as increasing milling time in this case. Finally, fermentation of the fermentable sugar by Clostridium beijerinckii NCIMB8052 gave slightly better butanol yields than cultures grown in a typical lab media (P2), with final concentrations of 6.91 and 6.66g/L, respectively.