

Nichchima Supantamart 2010: Optimization of Biomass Pretreatment for Increasing Enzymatic Hydrolysis. Master of Science (Biotechnology), Major Field: Biotechnology, Department of Biotechnology. Thesis Advisor: Assistant Professor Pramuk Parakulsuksatid, Ph.D. 156 pages.

Eucalyptus and Acacia wood are fast growing wood commonly found in Thailand. They are an alternative feedstock for the production of ethanol. Eucalyptus and Acacia chips have been pretreated by steam explosion at temperature 200 and 210 °C; 2, 4 and 6 minutes (logRo 3.24-4.02). The Eucalyptus and Acacia fiber contained the significant lowest hemicelluloses and high celluloses at 3.64 %DW, 53.94 %DW and 8.00 %DW, 51.05 %DW, at logRo 2.84 and logRo 3.54 respectively. Their pretreatment efficiencies of hemicelluloses removal were 81.38 % and 56.24 %, respectively.

Taguchi experimental design was used to optimize the alkaline extract condition of Eucalyptus and Acacia treated with optimize steam explosion condition and the 3 factors of $L_9(3^3)$ orthogonal array were selected. The following conditions of these biomass were obtained: 25% NaOH 70 °C of temperature and 90 minute of extraction time. At this optimal condition, The highest cellulose and the lowest lignin were 76.84, 16.79 %DW of the Eucalyptus fiber and 61.54, 29.86 %DW of the Acacia fiber, respectively. For eucalyptus fiber, the cellulose was increased 75.63 % but the hemicelluloses and lignin were decreased 89.21 and 32.00 % For Acacia fiber, the cellulose and lignin content were increased 32.24 and 12.93 %, whereas the hemicelluloses decreased 79.38 % from raw materials.

Enzymatic hydrolysis of Eucalyptus and Acacia in three different forms: raw material (untreated), steam exploded fiber and alkali extracted following the steam exploded fiber, were studied the effect of lignin removal and cellulose conversion into glucose. Therefore, it is concluded that the most effective pretreatment method for enzymatic hydrolysis for the two biomass was the steam explosion following the alkaline extraction. Eucalyptus fiber produced 29.47 g/l of glucose and the cellulose conversion ratio was 49.89 % (glucose yield of 34.52 %). The Acacia fiber produced 3.66 g/l glucose and the cellulose conversion ratio was 7.86 % (glucose yield of 5.35 %)

Student's signature

Thesis Advisor's signature