

## Optimization of organosolv pretreatment with sulfuric acid for enhancing enzymatic hydrolysis of Pitch Pine (*Pinus rigida*)

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**Abstract :** The object is to optimize the best condition of organosolv pretreatment process with sulfuric acid as a catalyst. As a material, Pitch pine (*Pinus rigida*) was ground and sieved through 40-mesh screen, and Celluclast and  $\beta$ -glucosidase were used as enzymes for enzymatic hydrolysis. Pretreatment processes were carried out in the minibomb, and 20 g of materials with 200 ml of 50% ethanol solution (v/v) with 1% sulfuric acid as a catalyst. Pretreatment temperature was varied from 150°C to 190°C, and time was varied from 0 to 20 min. Then, residual materials were used for enzymatic hydrolysis. The best conditions were selected by estimating followed enzymatic hydrolysis rate and degradable rates after pretreatment process.

The highest value of enzymatic hydrolysis rate was obtained as 55 - 60% at 160 and at 180°C, but the value decreased under more severe conditions. As the residual rates decreased under severe conditions, it inferred that the decrease of sugar contents limits enzymatic hydrolysis rates. Combined with enzymatic hydrolysis rate, degradable rates and H-factors, the temperatures at 160°C for 20 min and at 180°C for 0 min were concluded as the optimized conditions where have the lowest H-factor value for considering energy input.

**Key words :** Organosolv pretreatment, Pitch pine, *Pinus rigida*, bioethanol, enzymatic hydrolysis