

# Improving enzymatic hydrolysis of hazelnut shells by alkaline peroxide (APO) pretreatment

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Monomeric sugars from lignocellulosic biomass are generally produced by enzymatic hydrolysis. However, the presence of lignin makes the access of enzymes to cellulose or hemicellulose difficult, thus reducing the efficiency of the hydrolysis. An effective pretreatment method is required to increase accessibility of cellulose and hemicellulose and to remove lignin from biomass. Among chemical pretreatment, pretreatment of biomass with the combination of NaOH and hydrogen peroxide promotes the depolymerization of lignin via reacting lignin and related phenolics [1].

In this study, hazelnut shells were pretreated with H<sub>2</sub>O<sub>2</sub> (0, 2.0% and 4.0%, v/v) in 2% NaOH solution at different temperatures (30-60-90 °C) and pretreatment times (6, 24, 48 h). The solid to liquid ratio was 1/10. Commercial Celluclast 1.5L<sup>®</sup> and Novozyme 188 were used for cellulase and β-Glucosidase enzymes, respectively. The hydrolysis reactions were carried out at 50°C in an incubator for 48 h by shaking at 150 rpm. Glucose and xylose contents were analyzed by HPLC [2].

Although peroxide addition in 2% NaOH did not effect on either cellulose (92%) or hemicellulose recovery (35%) compare to those obtained by 2% NaOH itself, it was effective on the lignin removal. Glucose recovery also increased from 32% to 81% when only a 2% H<sub>2</sub>SO<sub>2</sub> addition to alkali solution. The temperature had negative effect on the glucose recovery due to the increasing solubility of the cellulose with temperature. Glucose recovery maximized as 81.25% at the 30°C, 6 h, 2% H<sub>2</sub>O<sub>2</sub> in 2% NaOH solution.

## References

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- [2] Sluiter, A., Hames, B., Ruiz, R., Scarlata, C., Sluiter, J. and Templeton, D. (2006), "Determination of sugars, byproducts, and degradation products in liquid fraction process samples," National Renewable Energy Laboratory, Golden, CO.

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