2015 Wood Chemistry – 4th Week Chemical Composition Analysis of Lignocellulosic Biomass

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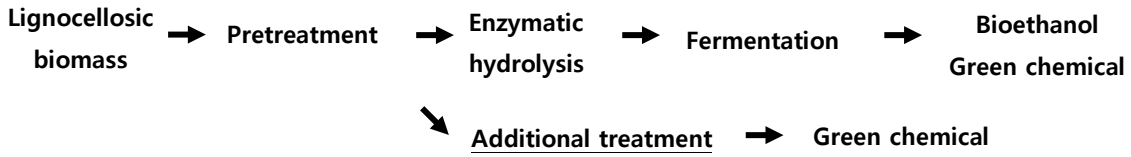
Bioenergy Production (Ⅱ) – Biomass Pretreatment (Conversion of liquid hydrolyzate)

After pretreatment process, recovered solid residues are utilized for producing bioethanol through enzymatic hydrolysis and fermentation. Meanwhile, liquid hydrolyzate, can be separated from solid residue, has been recognized as a waste because of low glucose content. In dilute acid pretreatment process, major component of the liquid hydrolyzate is carbohydrates, which are derived from hemicellulose, and small amount of lignin can be also included in the liquid hydrolyzate. Many studies have been conducted to utilize the wasted liquid hydrolyzate, as a result, liquid fermentation (pentose fermentation) is suggested. However, liquid fermentation has some problems such as lower activity of yeast using pentose than that using hexose and necessity of detoxification process causing by inhibitors. According to this trend, green chemical recently attracts researchers' attention as an alternative use of liquid hydrolyzate. The green chemical, mainly sugar derivatives such as furfural, levulinic acid, 5-hydroxymethylfurfural, acetic acid, and etc., can be applied agriculture, food additives, pharmaceutical, and chemical industry. In this lab, we will produce sugar derivatives by additional reaction of liquid hydrolyzate after pretreatment and evaluate how much sugar conversion to its derivatives.



1. Materials

① Sample : liquid hydrolyzate (obtained in 3rd week) **Mongolian Oak** (1 group), **Larch** (2 group), **Rapeseed stalk** (3 group)

② Equipment : Pretreatment reactor, Ice maker, Oven, Heating mantle, etc.

2. Methods

① Adjust sulfuric acid dosage of liquid hydrolyzate to its original concentration (1%, w/w)

② Put 200 ml of liquid hydrolyzate into an inner container.

③ Insert inner container to a pretreatment reactor, assemble the reactor, and lock the exhaust valve.

④ Set mantle temperature at 180℃, and raise the inner temperature (heating time : 50 min).

⑤ When inner temperature reaches 180℃, maintain temperature for 20 min.

⑥ Cool the reactor using ice chamber after reaction, and then take out the inner container.

⑦ Collect reacted liquid hydrolyzate. And 1 ml of sample is filtered by 0.45 μm membrane filter.

⑧ Sample will be characterized by HPLC in NICEM and students will analyze content of sugars (glucose, xylose, and etc.) and organic acid (furfural, 5-HMF, levulinic acid, acetic acid, formic acid).

3. Notice

※ Report should be written by MS words (10 points, line spacing 1) or hancom office (10 points, line spacing 120).

※ Write your report according to that order (in Korean or English): 1. Introduction, 2. Materials and methods, 3. Results and discussion, 4. Conclusions, 5. References

※ Describe result of 3rd week data, 4th week data, and 5th week data together, and should include result of other groups.

※ Assignment should be appended in report. (If you copy someone's report, you cannot get a grade.)

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