

SIIC038

A COMPARATIVE STUDY ON THE CHARACTERIZATION OF LIGNOCELLULOSE BIOMASS AFTER USING CHEMICAL PRETREATMENT METHODS

Nur Liyana Azmi¹ and Dr. Siti Sabrina Mohd Sukri²

¹Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang Malaysia

² Faculty of Chemical Engineering, Universiti Teknologi MARA Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang Malaysia

**Corresponding author: sabrina715@uitm.edu.my (Supervisor)*

Abstract:

Agricultural industry is one of major contribution in Malaysia's economy which produce tremendous biomass resources, contain any organic matter. This known as a lignocellulose biomass, the most abundantly renewable resources on Earth. Lignocellulose biomass is composed of a biological polymer namely lignin, hemicellulose and cellulose, which associated with each other by covalent and hydrogen bond. Therefore, the structure of lignocellulose biomass is highly recalcitrant and almost completely unavailable for conversion into commercial products. Thus, the chemical pretreatment which is acid and alkaline pretreatment methods is one of the strategies to disruption of lignocellulose structure. The aim of this study is to determine the effect of characterization and compare the structure of lignocellulose biomass after chemical pretreatment methods. Sodium hydroxide for alkali pretreatment and sulfuric acid for acid pretreatment was chosen, has the greater effective to enhanced lignocellulose structure. After both pretreatment was done, the physical and chemical structure can be observed. The results of disruption is to enhance the structure by increasing the accessibility of cellulose and also degrade hemicellulose and lignin content. Based on characterization of lignocellulose structure, acid pretreatment is mainly remove hemicellulose successfully while alkali pretreatment is degrade a lignin structure and partially remove hemicellulose. Furthermore, the comparison of chemical structure on lignocellulose biomass is observed after done the SEM and FTIR analysis. 4% of sodium hydroxide pretreatment shown more destruction compare to 4% of sulfuric acid it is because the degradation of lignin structure lead to hemicellulose removal and enhance the cellulose structure

Keywords:

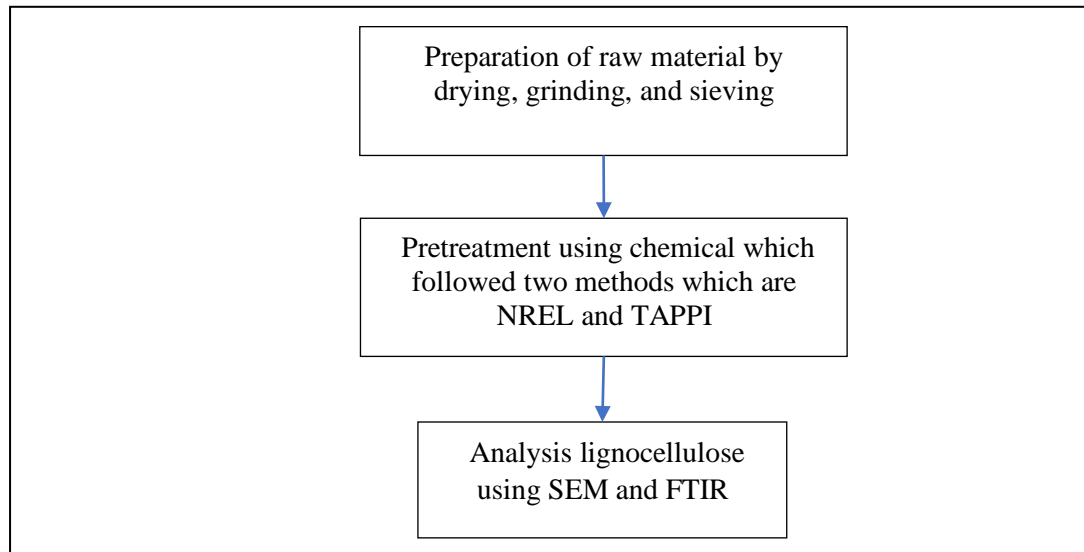
Lignocellulose biomass, Chemical pretreatment, Sodium hydroxide pre-treatment; Sulfuric acid pretreatment.

Objectives:

The aim of this study is to determine the characterization of biomass lignocellulose after using different chemical pretreatment

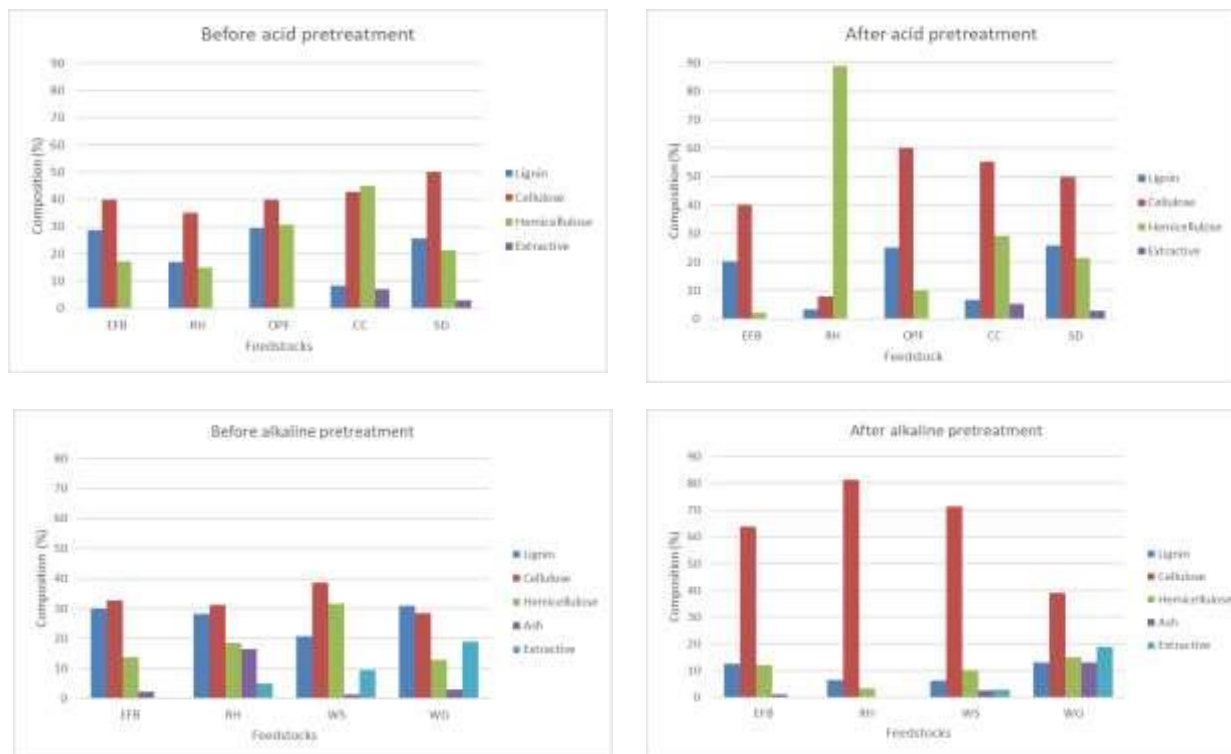
- To find the effective chemical pretreatment between acid and alkali pretreatment process.
- To compare the structural properties of lignocellulose after acid and alkali pretreatment process

Methodology:

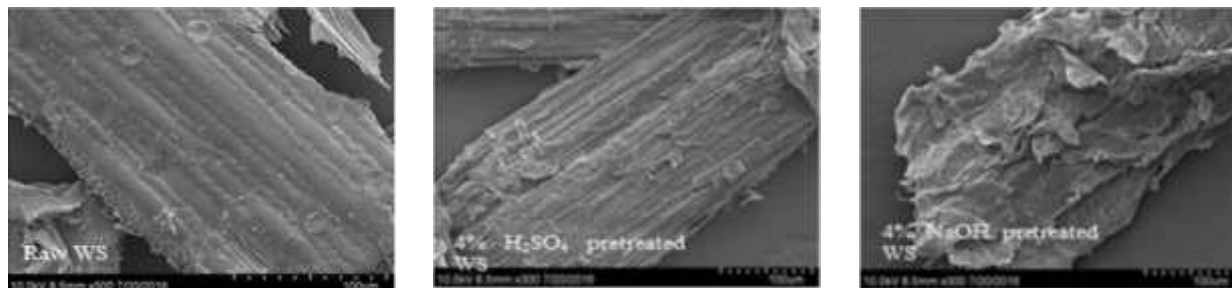


Results:

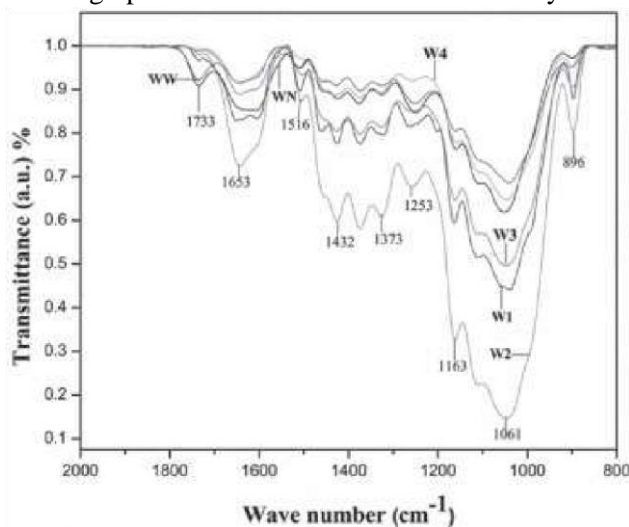
The graph shown the composition of lignocellulose biomass before and after chemical pretreatment.



The second pictures shown the structure of wheat straw before and after chemical pretreatment. This is using SEM analysis



The graph was collected after do FTIR analysis



Wave number (cm ⁻¹)	Band assignment
896	C-O-C vibrations at β -glucosidic linkage in cellulose and hemicelluloses
1038, 1061	C-O stretching of polysaccharides or polysaccharide substances
1163	C-O-C anti-symmetric
1253	Aromatic C-O stretching out of lignin
1373	CH ₂ vibration of cellulose
1432	CH ₂ vibration of cellulose
1516	Aromatic C=C stretching from aromatic ring of lignin
1653	Bending of absorbed residual water
1733	C=O stretching of unconjugated ketone and carboxyl groups

Conclusion:

The sodium hydroxide pretreatment is an effective method to remove lignin content while sulfuric acid pretreatment almost remove all hemicellulose content. The structure of lignocellulose can be destroyed when treated with sodium hydroxide pretreatment and sulfuric acid pretreatment. However, sodium hydroxide is most efficient to disrupt lignocellulose structure compare to sulfuric acid.