RJC

RASĀYAN *J. Chem.*
Vol. 11 | No. 4 |1458 - 1460| October - December | 2018
ISSN: 0974-1496 | e-ISSN: 0976-0083 | CODEN: RJCABP
http://www.rasayanjournal.com
http://www.rasayanjournal.co.in

LIGNIN ISOLATION FROM COCONUT COIR WITH VARIATION OF TIME AND CONCENTRATION OF NaOH IN THE PROCESS OF ALKALINE DELIGNIFICATION

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ABSTRACT

Coconut coir is natural fiber extracted from the hard, internal shell and the outer coconut and containing lignin to use the raw material of all-chemical industries. Lignin took by alkaline delignification step and then isolation process with acidity circumstance. Thatalkalinedelignificationproceed by NaOH solution is concentrated verify 15%-35% and time term is 60 – 150 minutes. Lignin isolation proceeds by H_2SO_4 solution 20% and the last process is purification. Lignin analysis used to Klason Method which the result has shown of the highestyieldof37.16% with NaOH solution 25% and time term is 120 minutes.

Keywords: alkaline delignification, coconut coir, lignin

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INTRODUCTION

Coconut coir is lignocellulose material which contains hemicellulose (0.25%), cellulose (43.44%), lignin (45.84%), pectin (3.00%) and water (5.25%).[9]It contains high lignin to gain function. Lignin is a class of complex organic polymers which is as a raw material of polymer product and chemical compounds with low density. In chemical industries, it can be sulfonate to lignosulfonate which used as raw material for synthetic fiber process such nylon.

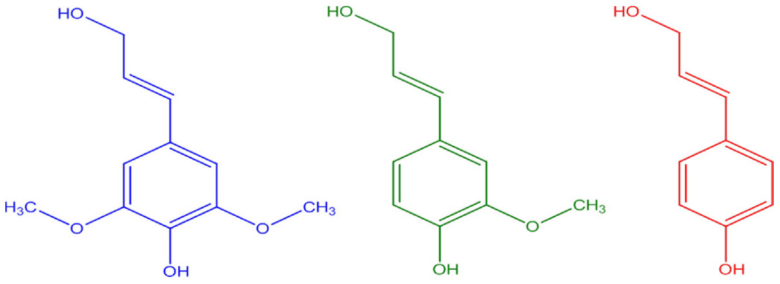

Fig.-1: Three Fundamental Lignin Monomers : Sinapyl Alcohol (syringyl (s), coniferyl alcohol (guaiacyl (G)), and p-coumaryl alcohol (p-hydroxyphenol (H))[5]

Empty *palm oil fruit* can be used as raw material by lignin isolation. The highest lignin yield could take 16.42% by NaOH solution is 20% and time term of 120 minutes.[4] Lignin isolation from black liquor proceed by soda pulping and sulfat pulping to create yield is 27.74% with H_2SO_4 solution 20%.[1] Some of the researchers was doing the experiment but not include alkaline delignification process as an initial step. In order to, the result of lignin is not optimal.[7]

EXPERIMENTAL

The raw material is Coconut coir and chemical compounds throughout alkaline delignification process such as ethanol are 96%, NaOH solution is 15%, 20%, 25%,30 %, 35%, H_2SO_4 is 20%, H_2SO_4 is 0.01N and

http://dx.doi.org/10.31788/RJC.2018.1144039

distilled water. The equipment used to batch reactor, vacuum pump, a beaker for analysis and digital balance.

Preparation of Raw Materials

The drying process of Coconut coir is in one week after that it is into the oven with a temperature of 110°C in 2 hours.[2] From that process, dryness of Coconut coir is cutting down around 3 cm.[6]

Delignification Process

50 grams of Coconut coir, liquor solution with comparing of 20 : 1 v/w (liquor solution = ethanol 96% : distilled water = 1 : 1) after that is gaining NaOH solution as many as 15 % from sample weight to batch reactor. Alkaline delignification process at a temperature of 170°C and time term is 60 minutes. That process is repetitive with NaOH solution variety of 20%, 25%, 30%, and 35%. In another hand, a variation of time term is 90 minutes, 120 minutes and 150 minutes.Liquor sample from alkaline delignification is diluted by distilled water with comparison 1 : 2. An H_2SO_4 solution of 20 % used to make acid condition until pH 2 which that process is coincidently heating up at 60°C and keeping up until 12 hours. After that, lignin sediments rinse with H_2SO_4 0.01 N and then use to distilled water. The result is drying at a temperature of 50 – 60°C and time term is 26 minutes until the weight of the sample is constant and form is powder. Thus, that lignin powder analysis with Klason method.[3]

RESULTS AND DISCUSSION

Lignin isolation of Coconut coir with alkaline delignification process is to appear the highest yield of lignin which used NaOH solution concentration variety of 15%, 20%, 25%, 30%, 35 % (v/w) and time of term process started from 60 minutes, 90 minutes, 120 minutes and 150 minutes. According to product presentation, yield lignin got from the comparison between the initial weight and final weight.

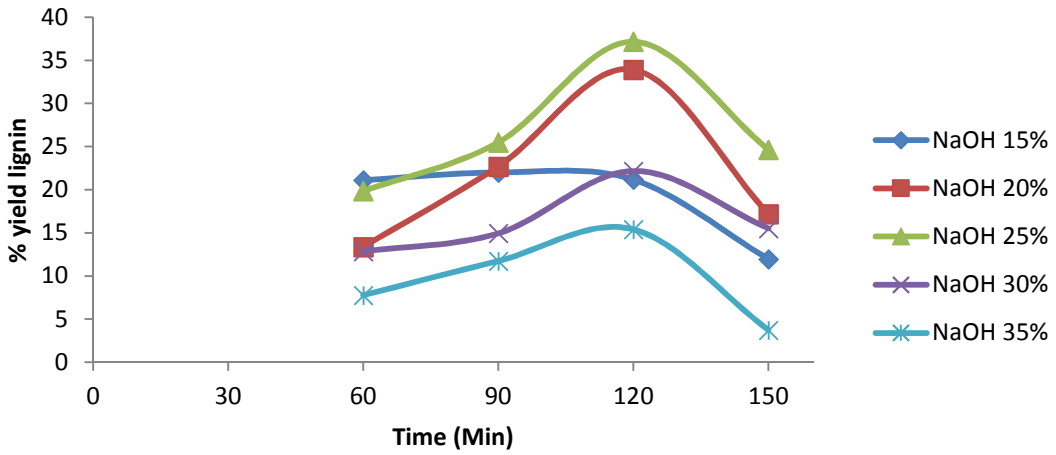

Fig.-2: Graph Time Process Vs % Yield Lignin

The lowest of yield lignin is 3.72% with time term is 150 minutes and NaOH solution is 35%. The effect time process of alkaline delignification to yield lignin could be seen at Fig.-2. In addition to the highest yield lignin is 37.6% with time term is 120 minutes and it used to NaOH solution of 25%. Accordingly increasing of yield lignin concentration occurred from 60-120 minutes, in 150 minutes that yield will be diminished.

The function of the alkaline solution is to break up lignocellulose bound but the result is relatively too small. In order to, augmentative of time process will be affecting delignification process. Increasing of time process will cause more dissolve lignin. Impregnation process between Coconut coir and solvent will be more completed. At the time of process which takes time, it will be the trigger of lignin constituent compounds degradation.[4] Yield lignin will consequently decrease but other factors can affect for that

resulted like excessive of nonlignin compound degradation. Thus, increasing of time process of yield lignin is too small to get.

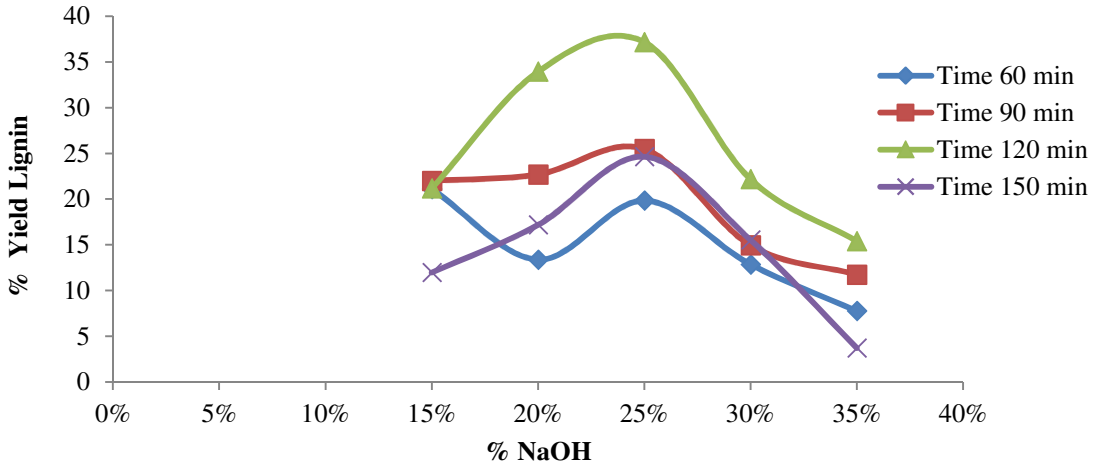

Fig.-3: Graph % NaOH Vs % Yield Lignin

Figure-3 will be seen NaOH concentration on black liquor between Coconut coir and yield lignin resulted. Yield lignin is to gain with NaOH concentration of 15 – 20% and it started down to the concentration of 30%.

NaOH concentration will be increasing to break bound of lignin constituent so lignin gets dissolving on black liquor. This condition will be increasing total sediment on black liquor consequently yield lignin concentration is also raised. Contradictorily, decreasing of yield started from NaOH solution of 30% because NaOH solution dissolves in water is too low. So, at delignification process, black liquor was saturated which that process is not eligible and yield lignin to get is too small. High concentration will reduce the amount of water in black liquor so it will diminish lignin can be taken from those compounds. Lehnen et al. (2006) reported of water sufficient needed to dissolve lignin from lignocellulose bound.[8]

The best condition of yield lignin concentration to get is NaOH concentration of 25% and time of process 120 minutes. That condition resulted in yield lignin of 37.16%

CONCLUSION

Based on the data obtained, the time and the NaOH concentrates affected lignin isolation process of coconut coir with alkaline delignification methods. Lignin yield of 37.16% was obtained at alkaline delignification process using NaOH 25% and processing time of 120 minutes.

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[RJC-4039/2018]