

CHAPTER V

CONCLUSIONS AND RECOMMENDATION

5.1 Conclusion

To determine the suitable acid type for 1-Ethyl-3-Methylimidazolium acetate ([Emim][Ac]) on Napier grass. Hydrochloric acid (HCl) and acetic acid (CH₃COOH) were investigated by using the optimal condition of ionic liquid pretreatment of previous work. The results show that the suitable acid type for 1-Ethyl-3-Methylimidazolium acetate ([Emim][Ac]) was acetic acid (CH₃COOH). It gave the high total sugar concentration than hydrochloric acid (HCl). Moreover, at low acid loading gave better results than high acid loading. Thus, acetate anion in acetic acid aqueous-[Emim][Ac] mixture can enhance acetate anion in ionic liquid ([Emim][Ac]). The ionic liquid pretreatment mechanism can explain these results; [Emim][Ac] breaks hydrogen bonding down. Then, [Emim]⁺ interacts with oxygen atom and acetate anion (CH₃COO⁻) interacts with hydrogen atom. Therefore, cellulose can dissolve in [Emim][Ac]. But, the ion size of chloride anion (Cl⁻) is smaller than acetate anion (CH₃COO⁻) then, chloride anion (Cl⁻) interacts with [Emim]⁺. Therefore, [Emim]⁺ cannot interact with hydrogen atom of cellulose. It led to lower sugar concentration when added hydrochloric acid (HCl) in [Emim][Ac]. In addition, at high acid loading, sugar concentration decreased due to severe condition and degradation of sugar.

Napier grass was used as a raw material to investigate the optimal condition. The response surface methodology can predict the optimal condition and it was found that the actual total sugar concentration was 14.38 g/l. It was differentiate from the model at 8.52%. Pretreatment of Napier grass in CH₃COOH aqueous-[Emim][Ac] at a microwave irradiation temperature and time of 147 °C, 76 min is sufficient to reduce lignin content and cellulose crystallinity index, resulting in high sugar yield of 98% after enzymatic hydrolysis.

5.2 Recommendation

For the future work, the optimization using RSM is supposed to vary the acid concentration range of 0-2 volume% acid. At high acid concentration, it has no significant effect on the model. To increase the total sugar concentration, might be varied temperature in range of 130-200 °C comparing the results with this work. In addition, biomass loading should be fixed at high loading for save cost of ionic liquid.