

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The sulfonated lignin catalyst is heterogeneous acid catalyst for biodiesel production via esterification from oleic acid. From the experiment, the activity of the sulfonated lignin catalysts related with the sulfonation temperature, sulfonation time, and the condition used in esterification reaction. The catalyst sulfonated at 110 °C 5 h exhibited high catalytic activity at 89.9% for biodiesel production from oleic acid. This solid acid catalyst consisted of high specific surface area and high pore size diameter that provide more acid sites surface area to the reactant. The high activity of sulfonated catalyst can be ascribed to the high acidity that corresponded with more –SO₃H groups as acid sites in catalyst. Moreover, the experimental results demonstrated that the biodiesel yield of the catalyst still remain stable around 90 % until 20 h of reaction. After that, the biodiesel yield decreased to 75 % at 32 h of reaction. In short, the optimum conditions of esterification reaction was 8 h of reaction time, 15:1 molar ratio of methanol to oil, amount of catalyst 5wt%, 300 rpm of stirrer speed. However, a decrease in catalytic activity after the 2nd run due to a reduction of active site by leaching of -SO₃H group.

5.2 Recommendations

In the part of catalyst preparation, the composition of pretreated corncob should be focused because extracted lignin should have the same amount every after pretreatment process. Moreover, the other biomasses should be studied.

In order to reach high %FAME yield, the catalyst should be increased acid properties. Furthermore, the pretreated corncob should be prepared by carbonization or pyrolysis in order to increase the strong bond between lignin and SO₃H in sulfonation reaction.

In the part of esterification, the conversion of oleic acid should be also studied.