STUDY OF MICROFILTRATION PERFORMANCE OF ALUMINA-KAOLIN CERAMIC MEMBRANE FOR REMOVAL OF GLYCEROL FROM BIODIESEL

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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ABSTRACT

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The production of biodiesel through the transesterification process produces several byproducts, mainly glycerol. Due to the negative effects of glycerol to the engine lifespan and efficiency, the free glycerol content in biodiesel was limited by the SNI and international standards below 0.02wt.% or 200 ppm, making the removal of glycerol one of the crucial process in biodiesel production. The conventional purification process requires high energy and generates high amounts of wastewater. Therefore the membrane separation technology becomes one of the prominent solutions, specifically the ceramic microfiltration membrane which has high thermal, chemical and mechanical strength. The development and application of a low-cost Alumina-Kaolin ceramic microfiltration membrane for water purification suggests potential in removing glycerol from biodiesel. The current study was done to evaluate the microfiltration performance of the Alumina-Kaolin ceramic membrane and to study the microstructure of the membrane affect to the separation performance. Several tests employed using different glycerol and water concentration in the feed of 1000 ppm, 5000 ppm and 10000 ppm. The evaluation gave high glycerol rejection rates of 92.07%, 98.52% and 98.94% for the respective feed concentrations with the permeate flux of 65.42 [l/(m^{2}h)], 61.09 [l/(m^{2}h)] and 52.91 [l/(m^{2}h)] respectively. The microstructure characterization using the SEM images show that the pores of Alumina-Kaolin ceramic membrane with the pore size of 0.18 μm could separate the larger particles of glycerol-water droplets and gave high separation performance.

Keywords: microfiltration, ceramic membrane, alumina, kaolin, biodiesel permeability, glycerol removal, membrane characterization

DEDICATION

I dedicate this work to myself, those who have been encouraging, supportive and there for me in every step I take on overcoming challenges and doing my best throughout my educational journey; family, friends, and for the future of science and technology in Indonesia.

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TABLE OF CONTENT

STATEMENT BY THE AUTHOR 2
ABSTRACT 3
DEDICATION 5
ACKNOWLEDGEMENT 6
TABLE OF CONTENT 8
LIST OF FIGURES 10
LIST OF TABLES 12
CHAPTER 1 - INTRODUCTION 13
1.1. Background 13
1.2. Research Objectives 14
1.3 Significance of Study 15
1.4 Research Questions 15
1.5 Hypothesis 15
CHAPTER 2 – LITERATURE REVIEW 16
2.1. Energy Situations 16
1.1. Global Energy Situation 17
1.2. Energy Situation in Indonesia 17
2.2. Renewable Energy 18
2.3. Biodiesel 18
2.3.1. Production and Purification of Biodiesel 19
2.3.2. Biodiesel Quality Standards 22
2.4. Membrane Separation Technology 24
2.4.1. Membrane Separation for Biodiesel Purification 27
2.4.2. Ceramic Membrane 28
2.4.3. Alumina-Kaolin Ceramic Membrane 29
2.4.4. Study on the Alumina-Kaolin Ceramic Membrane 29
CHAPTER 3 – RESEARCH METHOD 31
3.1. Venue and Time 31
3.2. Materials and Equipment 31
3.2.1. Materials 31
3.2.2. Equipment 32
3.3. Design of Experiment 33
3.4. Research Procedure 34
3.4.1. Fabrication of Alumina-Kaolin Ceramic Microfiltration Membrane 34

3.4.2. Microfiltration Experiment 35
3.4.3. Membrane Microstructure Analysis 40
CHAPTER 4 – RESULTS AND DISCUSSIONS 41
4.1. Microfiltration Performance of Alumina-Kaolin membrane 41
4.1.1. Permeate flux observation 44
4.1.2. Glycerol Rejection Rate 45
4.1.3. The Effect of Glycerol Concentration on Microfiltration Performance 48
4.2. Membrane Washing ..... **Error! Bookmark not defined.**
4.3. Characterization of Alumina-Kaolin Membrane Microstructure 54
4.3.1. Scanning Electron Microscopy (SEM) Analysis 55
4.4. Comparison of Microfiltration Performance with Previous Study and Commercial Alumina Membrane 58
4.4.1. Initial Permeate Flux of Pure Biodiesel 58
4.4.2. Microfiltration of Biodiesel containing 1000 ppm Glycerol 60
4.4.3. Effect of Glycerol Concentration on Alumina Membrane Microfiltration Performance 62
4.4.4. Membrane Characterization of Commercial Alumina 64
CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS 69
5.1. Conclusions 69
5.2. Recommendations 69
REFERENCES 71
APPENDICES 76
CURRICULUM VITAE 97

LIST OF FIGURES

Figures Page

2.1 World Energy Consumption of non-OECD and OECD countries (US Energy Information Administration, 2021) 17
2.2 Transesterification reaction (Atadashi, Aroua and Aziz, 2011) 20
2.3 Mechanism of Separation of Free Glycerol and Soap from FAME (Wang et al., 2009) 27
3.1 Design of Experiment Flowchart 33
3.2 Schematic Diagram of Microfiltration Experiment Set-Up 35
4.1 Permeate Flux of Pure Biodiesel through Alumina-Kaolin Membrane at 0.5 kg/cm² 44
4.2 Permeate Flux of Feed Biodiesel containing 1000 ppm glycerol through Alumina-Kaolin Membrane at 0.5 kg/cm² 45
4.3 Structure of 3,5-diacetyl-1,4-dihydrolutidine (Bondioli and Della Bella, 2005) 46
4.4 Standard Calibration Curve of Glycerol Reference Standards 47
4.5 Biodiesel and Glycerol Permeate Flux at 0.5 kg/cm^2 through Alumina-Kaolin Membrane 50
4.6 Effects of Water Concentration on Glycerol-Water Droplets Size (Saleh, 2011) 51
4.7 Initial Permeate Flux of Pure Biodiesel with the Permeate Flux of Pure Biodiesel after Washing of the Alumina-Kaolin Membrane 54
4.8 SEM Image of Alumina-Kaolin Membrane Inner Surface at 100x Magnification 55
4.9 SEM Image of Alumina-Kaolin Membrane Inner Surface at 1000x Magnification 56
4.10 SEM Image of Alumina-Kaolin Membrane Inner Surface at 5000x Magnification 56
4.11 SEM Image of Alumina-Kaolin Membrane Cross Sections and Parts of the Inner Surface at 1000x Magnification 57
4.12 Adsorption-Desorption Isotherm Graph of Alumina-Kaolin membrane 58

4.13 Pure Biodiesel Permeate Flux Comparison between Alumina-Kaolin (Az'zura and Current Research) and Alumina 60
4.14 Permeate Flux Biodiesel containing 1000 ppm Glycerol through Alumina-Kaolin (Az'zura & Current Research) and Commercial Alumina 61
4.15 Biodiesel with Various Glycerol Concentration Permeate Flux at 0.5 kg/cm^2 through Alumina Membrane 63
4.16 SEM Image of Alumina Membrane Inner Surface at 100x Magnification 65
4.17 SEM Image of Alumina Membrane Inner Surface at 1000x magnification 66
4.18 SEM Image of Alumina Membrane Inner Surface at 10000x Magnification 66
4.19 SEM Image of Alumina Membrane Inner and Cross Sections Surfaces at 1000x Magnification 67
4.20 Adsorption-Desorption Isotherm Graph of Commercial Alumina Membrane .. 68

LIST OF TABLES

Tables Page

2.1 Biodiesel Standard Value (Ivanova et al., 2016; Wibowo, Febriansyah and Suminto, 2019) 23
3.1 Sintering Process Setup for 1100°C (Meliyanti et al., 2018) 34
3.2 Compositions of Biodiesel, Water and Glycerol of the Feed Mixtures in the Microfiltration Experiment 36
3.3 Compositions of Glycerol Reference Working Solution and Working Solvent in the Standard Samples 38
4.1 Effect of Type of Dolapix and Concentration to the Viscosity of the Slip Suspension 42
4.2 Viscosity Effect of Dolapix PC 67 to the Casting Time and Thickness of the Membrane 42
4.3 Viscosity Effect of Dolapix CE 64 to the Casting Time and Thickness of the Membrane 43
4.4 Permeate concentration (C_p) and Rejection of Glycerol from 1000 ppm Glycerol in Feed through Alumina-Kaolin Membrane 47
4.5 Average Stable Permeate Flux and Flux Decline Ratio for Different Glycerol Concentration in Feed Solution 50
4.6 Concentration of Permeate (C_p) and Rejection Rate of Glycerol from 5000 ppm Glycerol in Feed through Alumina-Kaolin Membrane 52
4.7 Concentration of Permeate (C_p) and Rejection Rate of Glycerol from 10000 ppm Glycerol in Feed through Alumina-Kaolin Membrane 53
4.8 Flux Decline Ratio and Rejection Comparison for 1000 ppm Glycerol Feed Concentration 61
4.9 Comparison of the Microfiltration Performance of Alumina-Kaolin vs Commercial Alumina in Various Glycerol Feed Concentration 64
4.10 Comparison of BET Analysis Result between Alumina-Kaolin and Commercial Alumina Membranes 68