FABRICATION OF ALUMINA-KAOLIN CERAMIC MICROFILTRATION MEMBRANE FOR BIODIESEL PURIFICATION

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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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Biodiesel is one of the alternative fuels derived from renewable raw materials through transesterification reaction which also produces glycerol as a main by-product. However, glycerol can cause negative effects on diesel engines such as fuel filter blockage and fuel injector fouling, therefore it is necessary to do a purification process to increase the quality of biodiesel in accordance with SNI standard. The conventional method to remove glycerol from biodiesel is through wet washing method in which a vast amount of water must be used to extract glycerol and other residues from biodiesel. This method requires a large energy for heating and produces a large amount of wastewater. Membrane technology is a new separation technique that has great potential to be applied for the separation of glycerol from biodiesel since the separation mechanism is based on the microporous material that can separate particles in a liquid solution. This study aims to separate glycerol from biodiesel using a ceramic microfiltration membrane. The microfiltration experiment was carried out using a tubular alumina-kaolin ceramic membrane at various trans-membrane pressures of 0.2-0.3 kg/cm^2, 0.5-0.6 kg/cm^2, and 0.7-0.8kg/cm^2. The permeate flux of pure biodiesel was measured using a home-made microfiltration experimental set-up. A feed solution of biodiesel containing glycerol was used to measure the permeate flux and the rejection of glycerol. The rejection was determined from the glycerol concentration in the permeate that was measured under a periodate oxidation and Hantzsch reaction by using a UV-Vis Spectrophotometer. The result of the microfiltration experiment using the ceramic membrane showed a pure biodiesel permeate flux of 66 L/m^{2}h at a pressure of 0.5-0.6 kg/cm^2. Using biodiesel containing 1000 ppm glycerol as the feed solution, the membrane showed a permeate flux of 42 L/m^{2}h and a glycerol rejection of 77.5% at a pressure of 0.5-0.6 kg/cm^2. It was observed that the permeate flux increased with increasing the pressure. The result showed that the ceramic membrane has great potential for the purification of biodiesel.

Keywords: (ceramic membrane, alumina, kaolin, microfiltration, biodiesel permeability, free glycerol rejection).

DEDICATION

I dedicate this work to myself and those who have always encouraged me to constantly push, to overcome difficulties, and to never abandon throughout my entire educational journey: my family, fiancé, best friends, college friends, and the future of science and technology in Indonesia.

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