

ABSTRAK

PENGARUH VARIASI ENZIM LIPASE *AMOBIL* DAN RASIO MOL CPO:METANOL PADA TRANSESTERIFIKASI DI *PACKED BED REACTOR* TANPA ESTERIFIKASI

(Elisabeth Putri Dania, Halaman, Tabel, Gambar, 4 Lampiran)

Biodiesel merupakan bahan bakar alternatif yang bersifat terbarukan dan ramah lingkungan, dihasilkan dari minyak nabati atau hewani melalui proses fisik dan kimia tertentu. Dalam penelitian ini, bahan baku yang digunakan adalah *Crude Palm Oil* (CPO) dengan penambahan metanol, serta menggunakan enzim lipase Eversa Transform 2.0 sebagai katalis. Tujuan dari penelitian ini adalah untuk mengkaji pengaruh variasi massa enzim lipase yang di *amobil* dan rasio mol CPO:Metanol terhadap kualitas biodiesel yang dihasilkan melalui proses transesterifikasi dengan menggunakan reaktor tipe *Packed Bed*. Metode penelitian dimulai dengan proses *degumming*, proses netralisasi dan proses transesterifikasi dengan variasi katalis sebesar 12 gram, 13 gram, 14 gram, 15 gram dan 16 gram, Rasio Mol CPO:Metanol (1:4) dan (1:6), dengan suhu reaksi 40°C, dan waktu reaksi 6 jam. Hasil biodiesel terbaik diperoleh pada rasio mol 1:4 dan massa enzim 15 gram, dengan densitas 875,67 g/cm³, viskositas 3,97 mm²/s, angka penyabunan 177,65 mg-KOH/g, angka asam 0,32 mg-KOH/g, angka iodin 48,05 g I₂/100 g, angka setana 66,21, kandungan gliserol total 0,24%, titik nyala 125,1 °C, persen *yield* 90,20%, dan kandungan metil ester sebesar 97,31%. Seluruh parameter yang diuji berada dalam rentang standar SNI 7182:2015, menunjukkan bahwa metode ini efektif untuk menghasilkan biodiesel berkualitas tinggi dari CPO menggunakan katalis enzimatik.

Kata Kunci : Biodiesel, *Crude Palm Oil* (CPO), Enzim Lipase Eversa Transform 2.0, Resin Anion, Transesterifikasi.

ABSTRACT

EFFECT OF VARIATIONS IN AMOBIL LIPASE ENZYME AND THE MOLE RASIO OF CPO:METHANOL ON TRANSESTERIFICATION IN PACKED BED REACTOR WITHOUT ESTERIFIKASI

(Elisabeth Putri Dania, Pages, Tables, Figures, 4 Attacment)

Biodiesel is an alternative fuel that is renewable and environmentally friendly, produced from vegetable oils or animal fats through specific physical and chemical processes. In this study, Crude Palm Oil (CPO) was used as the raw material, combined with methanol, and utilized Eversa Transform 2.0 lipase enzyme as the catalyst. The objective of this research was to examine the effect of varying the immobilized lipase enzyme mass and the molar ratio of CPO to methanol on the quality of the biodiesel produced through the transesterification process using a Packed Bed Reactor type. The research method began with degumming, followed by neutralization, and then the transesterification process with catalyst variations of 12 grams, 13 grams, 14 grams, 15 grams, and 16 grams, and CPO:Methanol molar ratios of 1:4 and 1:6, at a reaction temperature of 40°C and a reaction time of 6 hours. The best biodiesel product was obtained at a molar ratio of 1:4 and an enzyme mass of 15 grams, with the following properties: density of 875.67 g/cm³, viscosity of 3.97 mm²/s, saponification value of 177.65 mg-KOH/g, acid value of 0.32 mg-KOH/g, iodine value of 48.05 g I₂/100 g, cetane number of 66.21, total glycerol content of 0.24%, flash point of 125.1 °C, yield percentage of 90.20%, and methyl ester content of 97.31%. All tested parameters fell within the range of the Indonesian National Standard (SNI) 7182:2015, indicating that this method is effective in producing high-quality biodiesel from CPO using an enzymatic catalyst.

Keywords: Biodiesel, Crude Palm Oil (CPO), Eversa Transform 2.0 Lipase Enzyme, Anion Resin, Transesterification.