PREPARASI BIODIESEL MELALUI TRANSESTERIFIKASI *IN SITU* BERBANTUAN GELOMBANG MIKRO DARI MIKROALGA *Chlorella vulgaris* DENGAN REAGEN METANOL

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INTISARI

Preparasi biodiesel melalui transesterifikasi *in situ* berbantuan gelombang mikro dari mikroalga *Chlorella vulgaris* dengan reagen metanol telah dilakukan. Penelitian ini diawali dengan melakukan transesterifikasi *in situ* berbantuan gelombang mikro dari *C. vulgaris* dengan reagen metanol dan katalis KOH, sentrifugasi dan evaporasi pelarut. Proses transesterifikasi *in situ* dilakukan dengan variasi rasio biomassa terhadap metanol, waktu reaksi dan konsentrasi katalis. Setiap produk dilakukan uji GC-MS untuk menentukan rendemen FAME yang dihasilkan. Produk hasil reaksi dikarakterisasi dengan FTIR dan ^{1}H-NMR. Serbuk mikroalga sebelum dan sesudah reaksi diamati dengan SEM.

Berdasarkan hasil penelitian, hasil produk dengan rendemen FAME tertinggi yang diperoleh yaitu sebesar 11,00% dengan rasio biomassa terhadap metanol 1:12, waktu reaksi 40 menit dan konsentrasi katalis 2%. Komposisi biodiesel (metil ester) berdasarkan hasil analisis GC-MS pada produk dengan rendemen FAME tertinggi yaitu terdiri dari metil miristat (5,98%), metil palmitoleat (22,87%), metil palmitat (29,36%), metil linoleate (1,78%), metil oleat (3,02%), metil arachidonate (2,45%) dan metil 5,8,11,14,17-eicosapentaenoat (15,29%). Konversi metil ester yang dihasilkan pada produk dengan rendemen FAME tertinggi yaitu sebesar 77,64%.

Kata kunci: biodiesel, chlorella, gelombang mikro, metil ester, transesterifikasi *in situ*

BIODIESEL PREPARATION THROUGH MICROWAVE-ASSISTED *IN SITU* TRANSESTERIFICATION OF *Chlorella vulgaris* MICROALGAE WITH METHANOL AS REAGENT

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ABSTRACT

Biodiesel preparation through microwave-assisted *in situ* transesterification of *Chlorella vulgaris* microalgae with methanol as reagent has been conducted. The research began with microwave-assisted *in situ* transesterification of *C. vulgaris* with metanol as reagent and KOH as catalyst, centrifugation, and solvent evaporation. *In situ* transesterification process was done by varying the ratio of biomass to solvent, reaction time, and catalyst concentration. Each of product was characterized by using GC-MS to calculate FAME yield. Reaction product was characterized by using FTIR and ^{1}H-NMR. Microalgae powders before and after the reaction were observed by using SEM.

The result showed that product with the highest FAME yield obtained was 11.00% with ratio of biomass to methanol 1:12, reaction time of 40 minutes, and catalyst concentration of 2%. The composition of biodiesel (methyl ester) based on the results of GC-MS analysis on products with the highest FAME yield consisting of methyl myristate (5.98%), methyl palmitoleate (22.87%), methyl palmitate (29.36%), methyl linoleate (1.78%), methyl oleate (3.02%), methyl arachidonate (2.45%), and methyl 5,8,11,14,17-eicosapentaenoate (15.29%). The conversion of methyl esters produced on products with the highest FAME yield was 77.64%.

Keywords: *in situ* transesterification, microwave, methyl ester, biodiesel, chlorella