

ABSTRAK

OPTIMASI PROSES TOREFAKSI MENGGUNAKAN *RESPONSE SURFACE METHODOLOGY* (RSM) UNTUK MENINGKATKAN KARAKTERISTIK PELET KALIANDRA

Oleh

PORTO MAURITIO

Penelitian ini bertujuan untuk menganalisis sifat fisis dan mekanis pelet kaliandra hasil torefaksi, serta mendapatkan suhu dan waktu tinggal optimum yang digunakan untuk mengoptimalkan torefaksi pelet kaliandra. Pelet ditorefaksi berdasarkan kombinasi suhu dan waktu yang telah direkomendasikan oleh *software design expert*. Sifat fisis dan mekanis yang diamati meliputi perubahan warna, kerapatan, dan kuat tekan. Hasil penelitian menunjukkan pelet berubah warna menjadi lebih gelap ditandai dengan nilai L^* yang meningkat serta nilai ΔE yang menurun seiring dengan kenaikan suhu dan lama waktu saat torefaksi. Kerapatan pelet setelah torefaksi berkisar antara $1,09 - 1,30 \text{ g/cm}^3$. Kekuatan tekan menurun seiring dengan kenaikan suhu dan lama waktu saat torefaksi. Suhu 240°C dengan waktu tinggal 30 menit menjadi kombinasi optimum dalam proses torefaksi pelet kaliandra. Kombinasi optimum ini didapatkan setelah melakukan verifikasi model menggunakan RSM (*Response Surface Methodology*) dengan hasil verifikasi berada pada kisaran 95% *Confident Interval* (CI) dan 95% *Prediction Interval* (PI).

Kata kunci: pelet, kaliandra, torefaksi, RSM (*Response Surface Methodology*).

ABSTRACT

OPTIMIZATION OF THE TORREFACTION PROCESS USING RESPONSE SURFACE METHODOLOGY (RSM) TO IMPROVE THE CHARACTERISTICS OF KALIANDRA PELLETS

By

PORTO MAURITIO

This study aims to analyze the physical and mechanical properties of torrefaction calliandra pellets, as well as obtain the optimum temperature and residence time used to optimize the torrefaction of calliandra pellets. The torrefaction process is based on the combination of temperature and time recommended by a software design expert. The physical and mechanical properties observed included color change, density, and compressive strength. The results showed that the pellets changed color to become darker marked by an increase in L^ value and a decrease in ΔE value with increasing temperature and length of time during torrefaction. Pellet density after torrefaction ranged from 1.09 – 1.30 g/cm³. The compressive strength decreases with increasing temperature and the length of time during torrefaction. The temperature of 240°C with a residence time of 30 minutes is the optimum combination in the torrefaction of calliandra pellets. This optimum combination was obtained after verifying the model using RSM (Response Surface Methodology) with the verification results in 95% Confident Interval (CI) and 95% Prediction Interval (PI).*

Keywords: *pellets, calliandra, torrefaction, RSM (Response Surface Methodology)*