ABSTRAK

Meningkatnya jumlah sampah plastik, khususnya jenis polypropylene (PP), menimbulkan permasalahan lingkungan karena sifatnya yang sulit terurai. Salah satu teknologi yang berpotensi mengatasi permasalahan tersebut adalah pirolisis, yaitu proses dekomposisi termal tanpa oksigen yang mampu mengonversi limbah plastik menjadi bahan bakar cair. Penelitian ini bertujuan menganalisis pengaruh variasi suhu pirolisis terhadap karakteristik bahan bakar cair berbasis sampah plastik polypropylene. Kajian teoritis yang digunakan meliputi konsep pirolisis, pengaruh temperatur terhadap proses cracking, serta karakteristik bahan bakar cair yang ditinjau dari nilai kalor, densitas, dan rendemen. Metode penelitian yang digunakan adalah eksperimen dengan variasi suhu 300°C, 400°C, dan 500°C selama 60 menit menggunakan reaktor pirolisis tipe batch. Bahan baku yang digunakan berupa limbah plastik PP sebanyak 1,25 kg pada setiap pengujian. Data yang diperoleh dianalisis secara deskriptif kuantitatif. Hasil penelitian menunjukkan bahwa suhu pirolisis berpengaruh signifikan terhadap karakteristik bahan bakar cair. Rendemen tertinggi diperoleh pada suhu 300°C sebesar 20,8%, kemudian menurun menjadi 15,6% pada 400°C dan 9,52% pada 500°C. Nilai kalor tertinggi juga diperoleh pada suhu 300°C sebesar 38.022,85 J/gram, sedangkan densitas terendah diperoleh pada suhu 400°C sebesar 1,011 g/ml. Secara keseluruhan, suhu 300°C menghasilkan karakteristik bahan bakar cair terbaik dengan rendemen dan nilai kalor tertinggi, sehingga berpotensi menjadi kondisi operasi yang paling optimal untuk pirolisis sampah plastik polypropylene.

Kata kunci: pirolisis, polypropylene, bahan bakar cair, suhu pirolisis, rendemen.

ABSTRACT

The increasing amount of plastic waste, particularly polypropylene (PP), has become an environmental concern due to its non-biodegradable nature. One promising technology to address this issue is pyrolysis, a thermal decomposition process carried out in the absence of oxygen that can convert plastic waste into liquid fuel. This study aims to analyze the effect of pyrolysis temperature variations on the characteristics of liquid fuel produced from polypropylene plastic waste. The theoretical framework includes pyrolysis principles, the influence of temperature on the cracking process, and liquid fuel characteristics evaluated through calorific value, density, and yield. An experimental method was employed using a batch-type pyrolysis reactor with temperature variations of 300°C, 400°C, and 500°C for 60 minutes. Polypropylene waste weighing 1.25 kg was used as the feedstock in each experiment. The collected data were analyzed using a quantitative descriptive approach. The results indicate that pyrolysis temperature significantly affects the characteristics of the liquid fuel. The highest yield was obtained at 300°C, reaching 20.8%, which decreased to 15.6% at 400°C and 9.52% at 500°C. The highest calorific value was also achieved at 300°C, amounting to 38,022.85 J/g, while the lowest density was recorded at 400°C, reaching 1.011 g/mL. Overall, a pyrolysis temperature of 300°C produced the most favorable liquid fuel characteristics, with the highest yield and calorific value, making it the most optimal operating condition for the pyrolysis of polypropylene plastic waste.

Keywords: pyrolysis, polypropylene, liquid fuel, pyrolysis temperature, yield.