ABSTRAK

KONVERSI LIMBAH *POLYETHYLENE TEREPHTHALATE* (PET) MENJADI BAHAN BAKAR CAIR MELALUI PROSES PIROLISIS MENGGUNAKAN KATALIS BENTONIT

(Muhamad Fikri Maulana, 51 Halaman, 14 Tabel, 10 Gambar, 3 Lampiran)

Peningkatan konsumsi bahan bakar fosil serta akumulasi limbah plastik Polyethylene Terephthalate (PET) menjadi permasalahan yang berdampak terhadap ketersediaan energi dan pencemaran lingkungan. Salah satu upaya untuk mengatasinya adalah mengonversi limbah PET menjadi bahan bakar cair melalui proses pirolisis menggunakan katalis bentonit. Penelitian ini bertujuan menganalisis pengaruh jumlah katalis bentonit terhadap yield, karakteristik, dan komposisi bahan bakar cair hasil pirolisis limbah PET. Proses dilakukan pada suhu 450°C selama 90 menit menggunakan 2 kg PET dengan variasi katalis bentonit 5%, 10%, 15%, 20%, dan 25% (%wt). Karakteristik yang dianalisis meliputi yield, densitas, viskositas, nilai kalor, dan titik nyala. Hasil menunjukkan yield tertinggi diperoleh pada katalis 10% sebesar 1,95%, sedangkan penambahan katalis di atas 10% menurunkan yield akibat secondary cracking. Densitas berkisar 749,17–821,01 kg/m³, viskositas 0,916–1,059 mm²/s, nilai kalor 32,24–35,18 MJ/kg, dan titik nyala 35,1–43,1°C. Penambahan katalis cenderung menurunkan densitas dan titik nyala serta meningkatkan nilai kalor. Analisis GC-MS pada sampel katalis 10% menunjukkan dominasi fraksi gasoline (35,76%), diesel (29,72%), kerosene (20,88%), dan heavy oil (12,25%), mengindikasikan efektivitas catalytic cracking dalam menghasilkan hidrokarbon ringan hingga menengah. Katalis bentonit 10% merupakan kondisi optimum untuk yield tertinggi, sedangkan katalis 20% menghasilkan karakteristik terbaik dengan nilai kalor tertinggi dan densitas mendekati bahan bakar ringan.

Kata Kunci: *Polyethylene Terephthalate*, pirolisis, katalis bentonit, bahan bakar cair, GC-MS.

ABSTRACT

CONVERSION OF POLYETHYLENE TEREPHTHALATE (PET) PLASTIC WASTE INTO LIQUID FUEL THROUGH PYROLYSIS USING BENTONITE CATALYST

(Muhamad Fikri Maulana, *51 Pages, 14 Tables, 10 Figures, 3 Appendices)*

The increasing consumption of fossil fuels and accumulation of Polyethylene Terephthalate (PET) plastic waste have become major issues affecting energy availability and environmental quality. One approach to address this is converting PET waste into liquid fuel through pyrolysis using bentonite as a catalyst. This study aimed to analyze the effect of bentonite catalyst loading on the yield, characteristics, and composition of liquid fuel from PET pyrolysis. The process was carried out at 450°C for 90 minutes using 2 kg of PET with bentonite loadings of 5%, 10%, 15%, 20%, and 25% (wt%). Parameters evaluated included yield, density, viscosity, calorific value, and flash point. The highest yield of 1.95% was obtained at 10 wt% catalyst, while loadings above 10 wt% decreased yield due to secondary cracking. Density ranged from 749.17–821.01 kg/m³, viscosity 0.916–1.059 mm²/s, calorific value 32.24–35.18 MJ/kg, and flash point 35.1–43.1°C. Increasing catalyst loading generally reduced density and flash point while increasing calorific value. GC-MS analysis of the 10 wt% sample showed dominant fractions of gasoline (35.76%), diesel (29.72%), kerosene (20.88%), and heavy oil (12.25%), indicating effective catalytic cracking in producing light-to-medium hydrocarbons. A bentonite loading of 10 wt% was optimum for the highest yield, while 20 wt% produced the best overall characteristics, with the highest calorific value and density closer to light fuels.

Keywords: *Polyethylene Terephthalate, pyrolysis, bentonite catalyst, liquid fuel, GC-MS.*