

ABSTRAK

Konversi Limbah Plastik *Polypropylene* (PP) Menjadi Bahan Bakar Cair Menggunakan Metode *Catalytic Cracking* dengan Katalis Zeolit

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Limbah plastik *polypropylene* (PP) merupakan salah satu jenis limbah yang sulit terurai sehingga perlu dimanfaatkan sebagai sumber energi alternatif. Penelitian ini bertujuan menganalisis pengaruh variasi konsentrasi katalis zeolit terhadap *yield* dan karakteristik bahan bakar cair hasil proses *catalytic cracking* plastik PP. Penelitian dilakukan menggunakan bahan baku 2 kg dengan temperatur 340–355°C, waktu operasi 120 menit, dan variasi katalis zeolit 3%, 5%, 7%, 9%, dan 11%. Produk yang dihasilkan dianalisis meliputi *yield*, densitas, viskositas, titik nyala, nilai kalor, dan komposisi senyawa menggunakan GC-MS. Hasil penelitian menunjukkan bahwa konsentrasi katalis zeolit memengaruhi jumlah dan kualitas bahan bakar cair. *Yield* tertinggi diperoleh pada penggunaan katalis 9% sebesar 10%, sedangkan pada 11% mengalami penurunan menjadi 9,5% akibat terjadinya *secondary cracking*. Nilai densitas dan viskositas meningkat seiring bertambahnya konsentrasi katalis, sedangkan titik nyala dan nilai kalor cenderung menurun. Analisis GC-MS menunjukkan bahwa produk didominasi fraksi gasoline sebesar 33,66%, diikuti kerosene 30,34%, solar 16,65%, dan senyawa hidrokarbon lainnya 19,30%. Berdasarkan hasil penelitian, penggunaan katalis zeolit 9% menghasilkan *yield* optimum, sedangkan katalis 3% menghasilkan karakteristik bahan bakar cair yang paling mendekati bahan bakar komersial.

Kata Kunci: Pirolisis, *Polypropylene*, Zeolit, Limbah Plastik, Bahan Bakar Cair

ABSTRACT

Conversion of Polypropylene (PP) Plastic Waste into Liquid Fuel Using the Catalytic Cracking Method with a Zeolite Catalyst

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Polypropylene (PP) plastic waste is a type of non-biodegradable waste that has the potential to cause environmental pollution. One alternative to utilize this waste is by converting it into liquid fuel through the catalytic cracking process using zeolite as a catalyst. This study aimed to analyze the effect of zeolite catalyst concentration on the yield and characteristics of liquid fuel produced from PP plastic. The experiment was conducted using 2 kg of PP plastic at a temperature of 340–355°C for 120 minutes with zeolite catalyst concentrations of 3%, 5%, 7%, 9%, and 11%. The products were analyzed for yield, density, viscosity, flash point, heating value, and chemical composition using GC-MS. The results showed that the zeolite catalyst concentration significantly affected both the quantity and quality of the liquid fuel. The highest yield of 10% was obtained with a 9% catalyst concentration, while increasing the catalyst concentration to 11% reduced the yield to 9.5% due to secondary cracking. Density and viscosity increased with increasing catalyst concentration, whereas flash point and heating value decreased. GC-MS analysis revealed that the liquid fuel consisted mainly of gasoline (33.66%), followed by kerosene (30.34%), diesel (16.65%), and other hydrocarbon compounds (19.30%). Overall, a 9% zeolite catalyst produced the optimum yield, while a 3% catalyst resulted in fuel properties that were closest to commercial fuel specifications.

Keywords: *pyrolysis, zeolite, plastic waste, liquid fuel*