ABSTRAK
KONVERSI LIMBAH PLASTIK *POLYPROPYLENE* (PP) DAN SEKAM PADI MENJADI BIO-OIL MELALUI PROSES *CO-PYROLYSIS* MENGGUNAKAN KATALIS ZEOLIT ALAM

(Nandita Dwi Auliya, 2026. Laporan Skripsi; 56 Halaman, 13 Tabel, 12 Gambar)

Peningkatan jumlah limbah plastik *polypropylene* (PP) dan sekam padi yang belum dimanfaatkan secara optimal mendorong perlunya pengembangan teknologi konversi limbah menjadi bahan bakar alternatif. Salah satu metode yang dapat digunakan adalah *co-pyrolysis*, yaitu proses penguraian termal campuran biomassa dan plastik tanpa oksigen untuk menghasilkan bio-oil. Penelitian ini bertujuan untuk mengetahui pengaruh rasio bahan baku PP dan sekam padi terhadap *yield* serta karakteristik bio-oil yang dihasilkan. Proses pirolisis dilakukan pada suhu 400℃ selama 60 menit menggunakan katalis zeolit alam teraktivasi HCl sebanyak 10% dengan variasi rasio PP:sekam padi 0:100, 25:75, 50:50, 75:25, dan 100:0. Data diperoleh melalui pengujian *yield*, densitas, viskositas, titik nyala, nilai kalor, dan GC-MS, kemudian dianalisis secara deskriptif dengan membandingkan karakteristik bio-oil terhadap standar bahan bakar minyak dan hasil penelitian terdahulu. Hasil penelitian menunjukkan bahwa *yield* tertinggi diperoleh pada rasio 75:25 sebesar 15,72%, sedangkan yield terendah pada rasio 0:100 sebesar 1,55%. Densitas bio-oil berkisar antara 0,898-1,202 g/mL, viskositas 2,80-9,13 cP, titik nyala 36-46℃, dan nilai kalor 29,56-31,62 MJ/kg. Rasio 50:50 menghasilkan nilai kalor tertinggi sebesar 31,62 MJ/kg. Hasil analisis GC-MS pada sampel optimum menunjukkan bahwa bio-oil didominasi oleh fraksi diesel (34,91%), diikuti gasoline (33,14%), kerosene (15,84%), dan *heavy oil* (14,93%). Penambahan polypropylene meningkatkan pembentukan senyawa hidrokarbon melalui efek sinergis selama proses *co-pyrolysis*, sehingga memperbaiki karakteristik bio-oil, meskipun kualitasnya masih belum memenuhi seluruh spesifikasi bahan bakar minyak komersial.

Kata Kunci : Bio-oil, *Co-pyrolysis*, *Polypropylene*, Sekam Padi, Karakteristik Bahan Bakar

ABSTRACT

CONVERSION OF POLYPROPYLENE (PP) PLASTIC WASTE AND RICE HUSK INTO BIO-OIL VIA CO-PYROLYSIS USING A NATURAL ZEOLITE CATALYST

(Nandita Dwi Auliya, 2026, Thesis Report; 56 Pages; 13 Tables, 12 Pictures)

The increasing amount of polypropylene (PP) plastic waste and rice husk that has not been optimally utilized has encouraged the development of waste conversion technologies into alternative fuels. One of the promising methods is co-pyrolysis, a thermochemical process that decomposes a mixture of biomass and plastic in the absence of oxygen to produce bio-oil. This study aimed to investigate the effect of PP and rice husk feedstock ratios on the yield and characteristics of the resulting bio-oil. The co-pyrolysis process was conducted at 400°C for 60 minutes using 10 wt.% HCl-activated natural zeolite as a catalyst, with PP:rice husk ratios of 0:100, 25:75, 50:50, 75:25, and 100:0. The obtained bio-oil was characterized by yield, density, viscosity, flash point, calorific value, and GC-MS analysis. The data were analyzed descriptively by comparing the bio-oil characteristics with commercial fuel standards and previous studies. The highest yield of 15.72% was obtained at the 75:25 ratio, while the lowest yield of 1.55% was obtained at the 0:100 ratio. The bio-oil exhibited a density of 0.898–1.202 g/mL, viscosity of 2.80–9.13 cP, flash point of 36–46°C, and calorific value of 29.56–31.62 MJ/kg, with the highest calorific value (31.62 MJ/kg) achieved at the 50:50 ratio. GC-MS analysis of the optimum sample indicated that the bio-oil was predominantly composed of the diesel fraction (34.91%), followed by gasoline (33.14%), kerosene (15.84%), and heavy oil (14.93%). The addition of polypropylene enhanced hydrocarbon formation through a synergistic effect during the co-pyrolysis process, thereby improving the bio-oil characteristics, although its quality has not yet fully met the specifications of commercial liquid fuels.

Keywords *: Bio-oil, Co-pyrolysis, Polypropylene, Rice Husk, Fuel Characteristics.*