ABSTRAK

Konversi Campuran Limbah Plastik Jenis *Polystyrene* dan *Polypropylene* Menjadi Bahan Bakar Cair Menggunakan Metode *Catalytic Cracking*

Abdur Rafi Prima Putra, 2026

Meningkatnya timbulan limbah plastik *polystyrene* (PS) dan *polypropylene* (PP) yang sulit terurai secara alami mendorong perlunya teknologi pengolahan yang mampu mengubah limbah tersebut menjadi energi alternatif bernilai guna, salah satunya melalui metode *catalytic cracking* berkatalis zeolit alam. Penelitian ini bertujuan menganalisis pengaruh variasi rasio katalis zeolit alam terhadap *yield* dan karakteristik bahan bakar cair hasil konversi campuran PS dan PP. Proses dilakukan pada suhu 450°C selama 120 menit dengan rasio bahan baku PS:PP 1:1 dan variasi katalis 10–30% dari massa bahan baku. Hasil menunjukkan yield meningkat seiring penambahan katalis, dari 14,33% (10%) hingga 44,00% (30%). Produk memiliki densitas 790,23–828,46 kg/m³, viskositas 3,87–5,77 mm²/s, titik nyala 27,8–29,6°C, dan nilai kalor 32,91–39,49 MJ/kg, dengan densitas yang telah memenuhi standar mutu solar dan minyak tanah komersial. Analisis GC-MS pada katalis 10% menunjukkan dominasi fraksi solar (C16–C20, 60–85%) disertai fraksi kerosin dan bensin. Produk bahan bakar cair ini berpotensi dikembangkan sebagai sumber energi alternatif sejenis solar.

Kata kunci: *Catalytic Cracking*, Limbah Plastik, *Polystyrene*, *Polypropylene*, Katalis Zeolit Alam, Bahan Cakar Cair, *Yield*

ABSTRACT

Conversion of a Mixed Waste Stream of Polystyrene and Polypropylene Plastics into Liquid Fuel Using the Catalytic Cracking Method

Abdur Rafi Prima Putra, 2026

The rising generation of polystyrene (PS) and polypropylene (PP) plastic waste—materials that do not readily biodegrade—has created a need for processing technologies capable of converting this waste into valuable alternative energy; one such approach is catalytic cracking using natural zeolite. This study aimed to analyze how varying the natural zeolite catalyst ratio affects the yield and characteristics of the liquid fuel produced from a PS and PP mixture. The process was conducted at 450°C for 120 minutes, using a 1:1 PS-to-PP feedstock ratio and catalyst loadings ranging from 10% to 30% of the feedstock mass. The results showed that the yield increased with higher catalyst loading, rising from 14.33% (at 10%) to 44.00% (at 30%). The resulting products exhibited densities of 790.23–828.46 kg/m³, viscosities of 3.87–5.77 mm²/s, flash points of 27.8–29.6°C, and calorific values of 32.91–39.49 MJ/kg; notably, the densities met the quality standards for commercial diesel and kerosene. GC-MS analysis of the product obtained with 10% catalyst loading revealed a predominance of the diesel fraction (C16–C20, 60–85%), alongside kerosene and gasoline fractions. This liquid fuel product shows potential for development as a diesel-like alternative energy source.

Keywords: *Catalytic Cracking, Plastic Waste, Polystyrene, Polypropylene, Natural Zeolite Catalyst, Liquid Product, Yield*