ABSTRAK

Permasalahan limbah plastik, khususnya dari jenis *High Density Polyethylene* (HDPE), semakin meningkat seiring dengan tingginya penggunaan produk plastik oleh masyarakat. Jenis plastik ini memiliki ketahanan tinggi terhadap degradasi alami, sehingga berpotensi mencemari lingkungan dalam jangka waktu panjang. Salah satu pendekatan pengolahan limbah yang efektif adalah metode pirolisis, yaitu proses pemanasan tanpa oksigen yang mampu mengubah plastik menjadi bahan bakar cair (minyak pirolisis). Penelitian ini menyelidiki pengaruh variasi suhu pirolisis (250°C, 350°C, dan 450°C) terhadap karakteristik bahan bakar cair dari sampah plastik HDPE. Hasil menunjukkan bahwa suhu berpengaruh signifikan terhadap kuantitas dan kualitas produk. Volume cairan tertinggi dihasilkan pada suhu 350°C (249 mL), sementara suhu 450°C menghasilkan volume terendah (198 mL) karena reaksi *cracking* sekunder yang intensif. Dari segi kualitas, densitas minyak menurun secara linier seiring kenaikan suhu, dengan nilai terendah 0,968 g/mL pada 450°C. Pengujian laju pembakaran menunjukkan bahwa minyak dari suhu 450°C memiliki laju paling lambat (3 ml/detik) dan waktu bakar terlama (39,21detik), mengindikasikan stabilitas pembakaran yang lebih baik. Berdasarkan analisis densitas dan karakteristik pembakarannya, minyak hasil pirolisis pada suhu 450°C merupakan produk yang paling mendekati sifat bahan bakar solar. Dengan demikian, suhu operasi berperan krusial dalam merekayasa keseimbangan antara *yield* dan kualitas bahan bakar alternatif dari limbah HDPE.

Kata Kunci : Pirolisis, Sampah HDPE, Suhu, Volume Hasil, Solar

ABSTRACT

The problem of plastic waste, particularly from High Density Polyethylene (HDPE), has been increasing along with the high consumption of plastic products by society. This type of plastic has high resistance to natural degradation, making it potentially harmful to the environment over long periods. One effective waste treatment approach is the pyrolysis method, which is a heating process in the absence of oxygen that can convert plastic into liquid fuel (pyrolysis oil). This study investigates the effect of variations in pyrolysis temperature (250°C, 350°C, and 450°C) on the characteristics of liquid fuel produced from HDPE plastic waste. The results indicate that temperature significantly affects both the quantity and quality of the products. The highest liquid volume was obtained at 350°C (249 mL), while the lowest volume was produced at 450°C (198 mL) due to intensive secondary cracking reactions. In terms of quality, the oil density decreased linearly with increasing temperature, reaching the lowest value of 0.968 g/mL at 450°C. Combustion rate testing showed that the oil produced at 450°C had the slowest rate (3 mL/second) and the longest burning time (39.21 seconds), indicating better combustion stability. Based on density analysis and combustion characteristics, the pyrolysis oil produced at 450°C is the product that most closely resembles the properties of diesel fuel. Therefore, operating temperature plays a crucial role in engineering the balance between yield and quality of alternative fuel derived from HDPE waste.

Keywords: *Pyrolysis, HDPE Waste, Temperature, Product Yield, Diesel Fuel*