PENGOLAHAN LIMBAH KEMASAN PLASTIK MULTILAYER LDPE (*LOW DENSITY POLYETHILENE*) DENGAN MENGGUNAKAN METODE PIROLISIS KONVENSIONAL DAN PIROLISIS *MICROWAVE*

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ABSTRAK

Peningkatan konsumsi energi dan peningkatan timbunan sampah merupakan dua permasalahan yang muncul seiring dengan pertumbuhan ekonomi dan pertambahan penduduk. Untuk mengatasi masalah sampah, khususnya limbah plastik, para pakar lingkungan dan ilmuwan dari berbagai disiplin ilmu telah melakukan berbagai penelitian dan tindakan. Salah satu caranya dengan mendegradasi limbah plastik kemasan multilayer LDPE (Low Density Polyethilene) dengan proses pirolisis konvensional dan pirolisis microwave. Tujuan dari percobaan ini adalah untuk mengetahui pengaruh suhu dan waktu proses pirolisis konvensional dan pirolisis microwave dalam mendegradasi limbah plastik LDPE dan membandingkannya. Proses pirolisis dilakukan menggunakan reaktor tertutup *semi batch stainless steel unstirred berkapasitas* 3,5 dm^3 operasi pada tekanan dalam reaktor 1 atm dan dialirkan nitrogen 0,5 L/min. Sampel limbah plastik yang digunakan sebanyak 60 gram plastik jenis low density polietilen (LDPE). Sampel dipanaskan sampai suhu 250, 350, atau 500 °C dan dipertahankan pada variabel waktu yaitu

selama 10, 30, dan 60 menit. Cara tersebut dilakukan juga pada proses pirolisis microwave menggunakan reaktor kaca. Produk liquid dianalisa dengan gas *chromatography–mass spectrometry* (GC-MS), gas tak terkondensasi dianalisa dengan gas kromatografi (GC) dan bahan baku dianalisa menggunakan *Fourier Transform infrared* (FTIR) dan menghitung yield produk cair, padat dan konsentrasi gas. Dari hasil percobaan didapatkan pirolisis microwave lebih baik dibandingkan pirolisis konvensional pada kondisi operasi 500^{o}C 60 menit dengan yield padat sebesar 4,67%, yield cair sebesar 23,65%, dan konsentrasi CH_4 sebesar 30,41% daripada konvensional pada kondisi operasi yang sama diperoleh yield padat sebesar 9,50%, yield cair sebesar 15,77%, dan konsentrasi CH_4 sebesar 30,78%.

Kata Kunci : pirolisis konvensional, pirolisis microwave, limbah plastik kemasan multilayer low density polyethylene (LDPE)

MULTILAYER PLASTIC PACKAGING WASTE TREATMENT LDPE (LOW DENSITY POLYETHILENE) PYROLYSIS BY USING CONVENTIONAL PYROLYSIS AND MICROWAVE PYROLYSIS

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ABSTRACT

Increased energy consumption and an increase in waste generation are two problems that rise due to economic growth and population growth. To overcome the problem of waste, especially plastic waste, environmental experts and scientists from various disciplines have conducted various studies and actions. One way to degrade plastic waste multilayer packaging LDPE (Low Density Polyethilene) with conventional pyrolysis and pyrolysis processes microwave. The purpose of this experiment was to determine the effect of temperature and time of conventional pyrolysis process and degrade the microwave pyrolysis of waste plastics LDPE and compare them. Pyrolysis process is done using a semi-closed reactor unstirred batch of stainless steel with a capacity of 3.5 dm^3 pressure in the reactor is operating at 1 atm and nitrogen flowed 0, 5 L / min. Samples of waste plastics are used as much as 60 grams of low-density polyethylene plastics (LDPE). The sample is heated to a temperature of 250, 350, or 500 ° C and maintained at that time variables for 10, 30, and 60 minutes. This way is done well in the microwave pyrolysis

process using glass reactor. Liquid products were analyzed by gas chromatography-mass spectrometry (GC-MS), non-condensable gas was analyzed by gas chromatography (GC) and pyrolysis samples were analyzed using Fourier Transform Infrared (FTIR) and calculating the yield of liquid products, solid and concentration of gas. From the experimental results obtained microwave pyrolysis better than conventional pyrolysis at 500^{o}C operating conditions of 60 minutes at a yield of 4.67% solid, liquid yield of 23.65%, and concentration of CH_4 30.41% yield than conventional on the same operating conditions obtained solid yield 9 , 50%, liquid yield of 15.77%, and concentration of CH_4 30.78%.

Keywords: conventional pyrolysis, microwave pyrolysis, multilayer packaging plastic waste low density polyethylene (LDPE)