

PERENKAHAN KATALITIK TERHADAP MINYAK HASIL PIROLISIS PLASTIK LDPE (LOW DENSITY POLYETHYLENE) MENGGUNAKAN KATALIS Cr-ZEOLIT

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INTISARI

Perengkahan katalitik terhadap minyak hasil pirolisis plastik LDPE menggunakan katalis Cr-Zeolit telah dilakukan. Penelitian ini bertujuan untuk menguji efektivitas katalis Cr-Zeolit, menentukan persen fraksi bensin, dan menentukan rasio katalis:umpan optimum pada hidrorengkah minyak pirolisis plastik.

Penelitian ini diawali dengan proses pirolisis plastik LDPE menggunakan reaktor pirolisis. Katalis Cr-Zeolit untuk hidrorengkah dibuat dari zeolit alam yang diaktivasi H_2SO_4 1 M. Impregnasi logam kromium dilakukan dengan cara impregnasi basah zeolit ke dalam larutan $Cr(NO_3)_3$ dengan alat *autoclave*. Selanjutnya, katalis yang dihasilkan dikalsinasi dan direduksi dengan gas hidrogen. Katalis dikarakterisasi dengan *Fourier Transform Infrared* (FTIR), *X-ray Diffraction* (XRD), *Surface Area Analyser* (SAA), *Atomic Absorption Spectrophotometer* (AAS), dan *Transmission Electron Microscope* (TEM) serta diuji keasamannya. Waktu *thermal cracking* divariasikan selama 15 dan 30 menit dengan laju alir gas H_2 20 mL/menit. Uji aktivitas dan selektivitas katalis terhadap hidrorengkah minyak plastik dilakukan pada waktu optimum dengan temperatur 300 °C menggunakan *microreactor*. Variasi rasio katalis:umpan yang digunakan yaitu 0,25; 0,5; dan 1,0 (% b/b). Produk cair yang diperoleh dianalisis dengan *Gas Chromatography-Mass Spectrometer* (GC-MS).

Hasil penelitian menunjukkan katalis Cr-Zeolit efektif meningkatkan produk cair pada hidrorengkah minyak pirolisis. Produk cair dan fraksi bensin terbesar dihasilkan dari penggunaan rasio katalis:umpan sebesar 1% (% b/b). Pada rasio tersebut dihasilkan produk cair sebesar 52,2% dan fraksi bensin sebesar 93,22%

Kata kunci: *Autoclave*, Cr-Zeolit, hidrorengkah, LDPE, pirolisis.

CATALYTIC CRACKING OF OIL FROM LDPE (LOW DENSITY POLYETHYLENE) PLASTIC PYROLISIS PRODUCT BY USING Cr-ZEOLIT CATALYST

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ABSTRACT

Catalytic cracking of LDPE plastic pyrolysis oil using Cr-Zeolite catalyst has been performed. This study aims to determine the effectiveness of Cr-Zeolite catalysts, determine the percent of gasoline fraction, and determine the optimal ratio of catalyst:feed on hydrocracking process of pyrolysis plastic oil.

This research begins with the process of pyrolysis of LDPE plastic using pyrolysis reactor. Cr-Zeolite catalyst for hydrocracking was made from natural zeolite activated by H_2SO_4 1 M. Chromium impregnation was performed by wet impregnation of zeolite into $Cr(NO_3)_3$ solution with autoclave. Furthermore, the obtained catalyst was calcined and reduced by hydrogen gas. The catalyst was characterized by Fourier Transform Infrared (FTIR), X-ray Diffraction (XRD), Surface Area Analyzer (SAA), Atomic Absorption Spectrophotometer (AAS), and Transmission Electron Microscope (TEM) and tested its acidity. The thermal cracking time varied during 15 and 30 minutes with a hydrogen flow rate of 20 mL/min. The catalyst activity and selectivity test against hydrocracking of plastic oil was carried out at optimum time with a temperature of 300 °C using a microreactor. Variation of the catalyst:feed ratio used was 0.25, 0.5, and 1.0 (% w/w). The obtained liquid product was analyzed by Gas Chromatography-Mass Spectrometer (GC-MS).

The results showed that Cr-Zeolite catalyst was effective in increasing the liquid product on hydrocracking of pyrolysis plastic oil. The largest liquid product and gasoline fraction was obtained from the use of catalyst:feed ratio 1% (% w/w). At the same ratio, liquid products obtained was 52.2% and gasoline fraction was 93.22%.

Keywords: Autoclave, Cr-Zeolite, hydrocracking, LDPE, pyrolysis.