# PENGARUH VARIASI WAKTU REFLUKS PADA PROSES DAUR ULANG POLIETILEN TEREFTALAT DENGAN METODE HIDROLISIS

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## Abstrak

Daur ulang limbah plastik polietilen tereftalat (PET) telah dilakukan dengan metode reaksi hidrolisis dengan proses refluks pada suhu 120°C, menggunakan katalis asam sulfat 7,4 M dan variasi waktu refluks selama 4 sampai dengan 12 jam dengan interval 2 jam. Rendemen terbanyak didapatkan pada variasi waktu refluks 12 jam sebesar 81,97%. Hasil rendemen kemudian dianalisis menggunakan *Fourier Transform Infrared* (FTIR), *Thermogravimetric Analyzis* (TGA), dan *Differential Scanning Calorimetry* (DSC). Analisis FTIR menunjukkan adanya gugus fungsi karbonil (C=O *stretch*) pada sekitar bilangan gelombang 1680 $cm^{-1}$, gugus fungsi hidroksil (-OH *stretch*) pada sekitar bilangan gelombang 2550 $cm^{-1}$ – 3100 $cm^{-1}$ dan gugus fungsi aromatik (C-H *stretch* aromatik) pada sekitar bilangan gelombang 3000 $cm^{-1}$. Hasil analisis termal TGA menyatakan dekomposisi rendemen hasil reaksi hidrolisis terjadi pada rentang suhu 41,67°C - 296°C dengan penurunan massa yang hilang sebesar 0,031 %. Hasil analisis termal DSC menyatakan rendemen hasil reaksi hidrolisis memiliki titik leleh sebesar 296,17°C. Dari hasil analisis-analisis yang telah dilakukan dan berdasarkan penelitian-penelitian terdahulu dapat disimpulkan bahwa rendemen hasil reaksi hidrolisis adalah monomer asam tereftalat.

Kata kunci: Asam tereftalat, Daur ulang, Depolimerisasi, Hidrolisis, Polietilen tereftalat (PET), Refluks

# THE REFLUX TIME'S EFFECT FOR RECYCLING PROCESS USING HYDROLYSIS METHOD OF POLYETHYLENE TEREPHTHALATE

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## Abstract

Waste plastic recycling polyethylene terephthalate (PET) has been carried out by the method of hydrolysis reaction with reflux process at a temperature of 120 ° C, using 7.4 M sulfuric acid catalyst and time variation reflux for 4 to 12 hours with intervals of 2 hours. The yield of the highest obtained at 12 h reflux time variation of 81.97%. Yield results then analyzed using Fourier Transform Infrared (FTIR), Thermogravimetric Analyzis (TGA), and Differential Scanning Calorimetry (DSC). FTIR analysis showed the presence of carbonyl functional group (C = O stretch) at about 1680 $cm^{-1}$, the hydroxyl functional group (-OH stretch) at about 2550 $cm^{-1}$-3100 $cm^{-1}$ and aromatic functional groups (CH stretch aromatic) at around 3000 $cm^{-1}$. The results of thermal analysis TGA decomposition yield results expressed hydrolysis reaction occurs at a temperature range of 41.67°C - 296°C with a decrease in the mass loss of 0.031%. The results of thermal analysis DSC stated yield results hydrolysis reaction has a melting point of 296.17°C. From the results of analyzes that have been conducted and based on previous studies it can be concluded that the yield of the reaction products of hydrolysis are terephthalic acid monomer.

Key word: Depolimerization, Hydrolysis, Polyethylene terephthalate (PET), Recycle, Reflux, Terephthalic acid (TPA)