

## DEALUMINASI DAN/ATAU DESILIKASI ZEOLIT ALAM KLATEN DENGAN PERLAKUAN HCl DAN/ATAU NaOH SEBAGAI KATALIS HIDRORENGKAH MINYAK GORENG BEKAS MENJADI BIOGASOLIN

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### ABSTRAK

Penelitian tentang dealuminasi dan/atau desilikasi zeolit alam Klaten dengan perlakuan HCl dan/atau NaOH sebagai katalis hidrorengkah minyak goreng bekas menjadi biogasolin telah dilakukan. Tujuan penelitian ini adalah untuk mempelajari pengaruh dealuminasi dan/atau desilikasi terhadap rasio Si/Al, luas permukaan, ukuran diameter pori zeolit alam serta mempelajari aktivitas dan selektivitas zeolit alam termodifikasi terhadap hidrorengkah minyak goreng bekas menjadi biogasolin. Zeolit alam (ZA) didealuminasi dengan HCl 3, 6, dan 9 M selama 1, 2, dan 3 jam sehingga diperoleh ZAD (3-1), ZAD (3-2), ZAD (3-3), ZAD (6-1), ZAD (6-2), ZAD (6-3), ZAD (9-1), ZAD (9-2), dan ZAD (9-3). ZA dan ZAD (9-2) didesilikasi dengan NaOH 0,5 M selama 30 menit sehingga diperoleh ZAB dan ZAD (9-2)B. Zeolit alam (ZA) dan hasil modifikasinya dikarakterisasi dengan *Fourier Transform Infrared Spectroscopy* (FTIR), *Inductively Coupled Plasma Atomic Emission Spectroscopy* (ICP-AES), *X-Ray Diffraction* (XRD), *Surface Area Analyzer* (SAA) dan uji keasaman dengan NH<sub>3</sub>. Uji aktivitas dan selektivitas katalis dilakukan melalui hidrorengkah minyak goreng bekas menjadi biogasolin dengan katalis zeolit alam dan zeolit alam termodifikasi. Produk hidrorengkah dianalisis menggunakan *Gas Chromatography-Mass Spectrometer* (GC-MS).

Hasil penelitian yang diperoleh menunjukkan terjadinya peningkatan luas permukaan setelah dealuminasi dan/atau desilikasi dengan perlakuan HCl dan/atau NaOH. Rasio mol Si/Al tertinggi diperoleh pada ZAD (9-2), yaitu 5,95. Ukuran diameter rerata pori zeolit meningkat pada ZAD (9-2)B yaitu dari 4,18 nm menjadi 5,55 nm. Selektivitas produk hidrorengkah zeolit alam yang diberi perlakuan dealuminasi dan/atau desilikasi terhadap fraksi biogasolin meningkat. Selektivitas tertinggi diperoleh dari ZAB yaitu 94,87%.

Kata kunci : zeolit alam, dealuminasi, desilikasi, hidrorengkah, minyak goreng bekas.

**DEALUMINATION AND/OR DESILICATION OF KLATEN NATURAL  
ZEOLITE WITH HCl AND/OR NaOH TREATMENT AS CATALYST  
FOR HYDROCRACKING OF USED COOKING OIL INTO  
BIOGASOLINE**

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**ABSTRACT**

The research about dealumination and/or desilication of Klaten natural zeolite with HCl and/or NaOH treatment as catalyst for hydrocracking of used cooking oil into biogasoline has been conducted. The purposes of the study were to study the effect of dealumination and/or desilication on Si/Al mol ratio, surface area, and pore diameter size of natural zeolites and also to study the activity and selectivity of modified natural zeolites on hydrocracking of used cooking oil into biogasoline. Natural zeolite (ZA) was dealuminated by HCl 3, 6, and 9 M for 1, 2, and 3 hours so ZAD (3-1), ZAD (3-2), ZAD (3-3), ZAD (6-1), ZAD (6-2), ZAD (6-3), ZAD (9-1), ZAD (9-2), and ZAD (9-3) was obtained. ZA and ZAD (9-2) was desilicated by NaOH 0,5 M for 30 minutes so ZAB dan ZAD (9-2)B was obtained. Natural zeolite (ZA) and the modified zeolite were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES), X-Ray Diffraction (XRD), Surface Area Analyzer (SAA) and acidity test with NH<sub>3</sub>. Afterwards, activity and selectivity of natural zeolite and the modified zeolite as a catalyst were tested on hydrocracking of used cooking oil into biogasoline. Each hydrocracking product was tested by Gas Chromatography-Mass Spectrometer (GC-MS).

The results showed an increase in the surface area of natural zeolite after dealumination and/or desilication with HCl and/or NaOH treatment. The highest Si/Al mol ratio was obtained from ZAD (9-2). The increase of pore diameter size of zeolite was obtained on ZAD (9-2)B from 4.18 into 5.55 nm. The selectivity of hydrocracking products towards biogasoline fraction after desilication and/or dealumination was increased. The highest selectivity towards biogasoline was obtained by ZAB with selectivity of 94.87%.

Keywords: natural zeolite, dealumination, desilication, hydrocracking, used cooking oil.