

**MATERIAL Cr/SILIKA (Cr/SiO<sub>2</sub>) TERSULFATASI MESOPORI  
SEBAGAI KATALIS HIDRORENGKAH MINYAK GORENG SAWIT  
BEKAS MENJADI BIOGASOLIN**

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**INTISARI**

Preparasi, karakterisasi dan aplikasi katalis Cr-SO<sub>4</sub>/SiO<sub>2</sub> berdimensi mesopori untuk hidrorengkah minyak goreng sawit bekas menjadi biogasolin telah dilakukan. Tujuan dari penelitian ini yaitu mempelajari preparasi, karakterisasi, aktivitas dan selektivitas katalis Cr/Silika (Cr/SiO<sub>2</sub>) tersulfatasi berdimensi mesopori terhadap proses hidrorengkah minyak goreng sawit bekas menjadi biogasolin. Preparasi katalis SO<sub>4</sub>/SiO<sub>2</sub> mesopori dilakukan dengan metode *sol-gel* dari prekursor TEOS dan variasi konsentrasi H<sub>2</sub>SO<sub>4</sub> 1, 2, 3, dan 4 M serta penambahan NaHCO<sub>3</sub>. *Gel* yang terbentuk kemudian direfluks dengan metanol. Katalis yang terbentuk dikalsinasi pada temperatur 400, 500, dan 600 °C. Impregnasi logam Cr dengan variasi massa 0,5; 1; dan 1,5% (b/b) ke dalam katalis SO<sub>4</sub>/SiO<sub>2</sub> dilakukan dengan pengadukan 24 jam pada suhu ruang. Katalis dikarakterisasi menggunakan spektrofotometer *Fourier Transform Infrared* (FTIR), uji keasaman secara gravimetri dengan amonia, *X-Ray Diffraction* (XRD), *Scanning Electron Microscope* (SEM-EDS *Mapping*), *Surface Area Analyzer* (SAA), dan *Atomic Absorption Spectrophotometer* (AAS). Katalis SiO<sub>2</sub>, SO<sub>4</sub>/SiO<sub>2</sub> dan Cr-SO<sub>4</sub>/SiO<sub>2</sub> dengan keasaman tertinggi akan diuji aktivitas dan selektivitasnya pada proses hidrorengkah minyak goreng sawit bekas menjadi biogasolin dan diuji dengan GC-MS.

Hasil karakterisasi menunjukkan sintesis katalis SiO<sub>2</sub>, SO<sub>4</sub>/SiO<sub>2</sub>, dan Cr-SO<sub>4</sub>/SiO<sub>2</sub> telah berhasil dilakukan. Berdasarkan hasil karakterisasi, muncul gugus-gugus penting pada hasil FTIR, berstruktur amorf pada hasil XRD, nilai keasaman tertinggi terjadi oleh katalis Cr-SO<sub>4</sub>/SiO<sub>2</sub> sebesar 8,57 mmol/g pada hasil uji asam, terjadi perubahan morfologi dan distribusi unsur setelah dilakukan proses sulfatasi dan impregnasi logam Cr pada hasil SEM-EDS *Mapping*, serta dengan sistem mesopori pada hasil SAA. Pada uji aktivitas dan selektivitas dari hasil GC-MS, katalis dalam proses hidrorengkah menunjukkan bahwa katalis Cr-SO<sub>4</sub>/SiO<sub>2</sub> memiliki aktivitas tertinggi dengan persentase konversi produk cair sebesar 37,4% dan paling selektif terhadap fraksi gasolin dengan persen hasil sebesar 29,38%.

Kata kunci: hidrorengkah, impregnasi Cr, minyak goreng sawit bekas, silika tersulfatasi.

***CHROMIUM/SILICA (Cr/SiO<sub>2</sub>) SULFATED MESOPOROUS MATERIAL AS  
A HYDROCRACKING CATALYST OF USED COOKING OIL INTO  
BIOGASOLINE***

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**ABSTRACT**

Preparation, characterization and application of mesoporous dimension Cr-SO<sub>4</sub>/SiO<sub>2</sub> catalyst for hydrocracking used cooking oil into biogasoline has been carried out. The purpose of the research is to study the preparation, characterization, activity and selectivity of sulfated Cr/Silica (Cr/SiO<sub>2</sub>) catalyst with mesoporous on the hydrocracking process of used cooking oil into biogasoline. The preparation of mesoporous SO<sub>4</sub>/SiO<sub>2</sub> catalyst was done using the sol-gel method of TEOS precursor and varying concentrations of H<sub>2</sub>SO<sub>4</sub> 1, 2, 3, and 4 M with the addition of NaHCO<sub>3</sub>. The gel formed was refluxed with methanol. Calcination was done for the catalyst at temperatures of 400, 500, and 600 °C. Impregnation of Cr metal with variations of 0.5, 1, and 1.5 % into SO<sub>4</sub>/SiO<sub>2</sub> catalyst was done by stirring for 24 hours at room temperature. The catalyst was characterized using a Fourier Transform Infrared (FTIR) spectrophotometer, gravimetric acidity test with ammonia, X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM-EDS Mapping), Surface Area Analyzer (SAA), and Atomic Absorption Spectrophotometer (AAS). The catalysts of SiO<sub>2</sub>, SO<sub>4</sub>/SiO<sub>2</sub> and Cr-SO<sub>4</sub>/SiO<sub>2</sub> with the highest acidity will be tested for their activity and selectivity in the hydrocracking process of used cooking oil into biogasoline. The activity test was carried out using a reactor at the optimum temperature for 2 hours, and the selectivity test was carried out using GC-MS to analyze the product formed from the hydrocracking process.

The characterization of SiO<sub>2</sub>, SO<sub>4</sub>/SiO<sub>2</sub>, and Cr-SO<sub>4</sub>/SiO<sub>2</sub> catalysts indicates the successful synthesis by the appearance of certain peaks on the FTIR, an amorphous structure in the XRD results, the highest acidity value occurred by the Cr-SO<sub>4</sub>/SiO<sub>2</sub> catalyst of 8.57 mmol/g in the acid test results, changes in morphology and distribution of elements after the process of sulfatation and impregnation of Cr metal on SEM-EDS Mapping results were done, as well as with the mesoporous system on SAA results. The activity and selectivity test of the catalyst in the hydrocracking process by GC-MS showed that the Cr-SO<sub>4</sub>/SiO<sub>2</sub> catalyst produced the highest activity with a liquid product conversion of 37.4% and gasoline fraction selectivity of 29.38%.

Keywords: hydrocracking, Cr impregnation, used cooking oil, sulfated silica.