

PREPARASI DAN KARAKTERISASI KATALIS Co DAN CoMo TEREMBAN PADA SILIKA MESOPORI UNTUK HIDRORENGKAH PELUMAS BEKAS

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INTISARI

Telah dilakukan preparasi dan karakterisasi sampel katalis Co dan CoMo teremban pada silika mesopori menggunakan gelatin sebagai cetakan. Katalis ini digunakan dalam reaksi hidrorengkah pelumas bekas. Gelatin diekstrak dari tulang kaki sapi menggunakan larutan CH_3COOH , NaOH , HCl dan akuabides pada variasi temperatur hidrolisis ($50\text{ }^\circ\text{C}$, $70\text{ }^\circ\text{C}$ dan $90\text{ }^\circ\text{C}$). Analisis gelatin dilakukan dengan spektrofotometer FT-IR dan SDS-PAGE. Sintesis sampel silika mesopori (SM) dilakukan dengan metode hidrotermal. Logam Co diembankan pada sampel SM (Co/SM) secara impregnasi basah dan logam Co serta Mo diembankan pada sampel SM secara impregnasi basah sekuensial (CoMo/SM1) dan kodeposisi (CoMo/SM2). Karakterisasi sampel katalis dilakukan dengan spektrofotometer FT-IR, BET, AAS, SEM-EDX dan TEM. Proses hidrorengkah pelumas bekas dilakukan dengan menggunakan reaktor *stainless steel* sistem *semi-batch*. Perbandingan antara umpan/katalis sebesar 20 pada temperatur $450\text{ }^\circ\text{C}$ dengan laju alir gas hidrogen sebesar 10 mL/min . Produk cair yang dihasilkan ditimbang dan dianalisis menggunakan GC-MS.

Secara kuantitatif dan kualitatif gelatin yang diekstrak pada suhu $90\text{ }^\circ\text{C}$ menunjukkan hasil terbaik. Silika mesopori berhasil disintesis dengan diameter $4,308\text{ nm}$ bertipe *wormhole-like*. Sampel katalis Co/SM memiliki kandungan logam tertinggi (0,86%) diikuti CoMo/SM1 (0,84%) dan CoMo/SM2 (0,64%). Pengembanan logam meningkatkan keasaman dan luas permukaan spesifik, meningkatkan diameter pori kecuali untuk sampel CoMo/SM1 serta tidak merubah volume total pori secara signifikan untuk semua sampel. Aktivitas katalitik dalam menghasilkan produk cair tertinggi dimiliki oleh sampel katalis Co/SM (49,90%) diikuti CoMo/SM2 (44,61%), SM (21,07%), CoMo/SM1 (14,93%) dan tanpa katalis (6,63%). Selektivitas sampel katalis terhadap fraksi bensin tertinggi dimiliki oleh sampel katalis Co/SM (34,13%) diikuti oleh CoMo/SM2 (24,16%), CoMo/SM1 (11,76%), SM (11,68%) dan tanpa katalis (4,43%).

Kata kunci : gelatin, silika mesopori, Co, CoMo, hidrorengkah

PREPARATION AND CHARACTERIZATION OF Co AND CoMo MESOPOROUS SILICA FOR HYDROCRACKING OF WASTE LUBRICANT

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ABSTRACT

Preparation and characterization of Co and CoMo loaded on mesoporous silica as a catalyst using gelatin as a template have been investigated. The catalyst used for the hydrocracking of waste lubricant. Gelatin was extracted from bovine leg's bone using CH_3COOH , NaOH , HCl and distilled water at variation of hydrolysis temperature (50°C , 70°C and 90°C). The gelatins were characterized by FT-IR spectrophotometer and SDS-PAGE. The mesoporous silica (SM) sample was synthesized by hydrothermal method. The Co metal was loaded on to the SM sample by wet impregnation method (Co/SM) and the Co and Mo metals were loaded on to the SM sample by using sequential wet impregnation (CoMo/SM1) and codeposition wet impregnation (CoMo/SM2). The catalysts were characterized by FT-IR spectrophotometer, BET, SSA, SEM-EDX and TEM. The hydrocracking process of waste lubricant was conducted using a stainless steel reactor of semi-batch system at ratio of feed/catalyst of 20 and temperature of 450°C with 10 mL/min hydrogen flow rate. Liquid product of the process was weighed then analyzed with GC-MS.

Quantitatively and qualitatively the gelatin extracted at 90°C showed the best result. Mesoporous silica was successfully synthesized with pore diameter of 4.308 nm and wormhole-like pore shape. The Co/SM catalyst sample has the highest metal containing (0.86%) then CoMo/SM1 (0.84%) and CoMo/SM2 (0.64%). Metal loaded on mesoporous silica increased the acidity, increased pore diameter except for CoMo/SM1 sample and not decreased total pore volume significantly for all sample. The Co/SM catalyst sample has the highest activity to produce liquid product (49.90%) followed by CoMo/SM2 (44.61%), SM (21.07%), CoMo/SM1 (14.93%) and without catalyst (6.63%). Co/SM has the highest selectivity to produce gasoline fraction (34.13%) followed by CoMo/SM2 (24.16%), CoMo/SM1 (11.76%), SM (11.68%) and without catalyst (4.43%).

Keywords : gelatin, mesoporous silica, Co, CoMo, hydrocracking