

**SINTESIS DAN KARAKTERISASI KATALIS Ni-NH₂/SILIKA
MESOPORI DARI SILIKA LUMPUR SIDOARJO DAN CETAKAN
GELATIN TULANG SAPI UNTUK KONVERSI MINYAK GORENG
BEKAS MENJADI *BIOFUEL***

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INTISARI

Telah dilakukan sintesis dan karakterisasi katalis Ni-NH₂/silika mesopori (SM) dari silika lumpur Sidoarjo dan cetakan gelatin untuk konversi minyak goreng bekas menjadi *biofuel*. Ekstraksi silika dari lumpur Sidoarjo dan gelatin dari tulang sapi menggunakan metode gabungan asam-basa. Sintesis SM dilakukan dengan metode hidrotermal dalam autoclave pada suhu 100 °C selama 24 jam. Material SM dikarakterisasi dengan *Fourier Transform Infrared* (FTIR), *surface area analyzer* dan *Transmission Electron Microscope* (TEM). Pengembangan logam nikel pada SM dilakukan dengan metode impregnasi basah (diperoleh material Ni/SM) kemudian SM dan Ni/SM dimodifikasi dengan penambahan gugus amina (APTMS) secara *grafting* diperoleh material NH₂/SM dan Ni-NH₂/SM. Ni/SM dikarakterisasi menggunakan *X-ray Fluorescence* (XRF). NH₂/SM dan Ni-NH₂/SM dikarakterisasi dengan FTIR. Uji aktivitas katalis dilakukan pada konversi minyak goreng bekas menggunakan katalis Ni-NH₂/SM dan campuran katalis (Ni/SM+NH₂/SM). Produk cair hasil konversi minyak goreng bekas dianalisis dengan metode gravimetri dan *Gas Chromatography-Mass Spectrometry* (GCMS).

Hasil penelitian menunjukkan bahwa SM memiliki struktur karakteristik seperti lubang cacing (*wormhole-like*) dengan diameter pori, luas permukaan dan volume pori berturut-turut 4,9 nm, 666,76 m²/g dan 2,666 cm³/g. Konversi minyak goreng bekas dengan katalis Ni-NH₂/SM dan campuran katalis Ni/SM+NH₂/SM menghasilkan produk cair berturut-turut 34,18% dan 92,85% (b/b). Selektivitas fraksi bensin tertinggi (29,95% b/b) dihasilkan oleh katalis Ni-NH₂/SM dan fraksi solar tertinggi (63,35% b/b) dihasilkan oleh katalis campuran (Ni/SM+NH₂/SM).

Kata kunci: silika, mesopori, katalis, bifungsional dan biofuel

SYNTHESIS DAN CHARACTERIZATION OF Ni-NH₂/MESOPOROUS SILICA CATALYST OF SILICA SIDOARJO MUD AND GELATIN TEMPLATE BOVINE BONE FOR CONVERSION OF WASTE COOKING OIL INTO BIOFUEL

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ABSTRACT

The synthesis and characterization of Ni-NH₂/mesoporous silica (SM) silica Sidoarjo mud and gelatin template bovine bone for the conversion of waste cooking oil into biofuel has been conducted. Extraction of silica from Sidoarjo mud and gelatin from bovine bone used a combined method of acids and bases. Synthesis of SM was done hydrothermal method into autoclave at temperature 100 °C for 24 hours. SM material was characterized by FTIR, surface area analyzer and TEM. Impregnation of Ni pada MS was done wet impregnation method (obtained Ni/SM materials) then MS and Ni/MS were by modified of amine group (APTMS) with grafting method obtained NH₂/SM and Ni/SM. Ni/SM was characterized using X-ray Fluorescence (XRF). NH₂/SM and Ni-NH₂/SM were characterized by FTIR. The activity test of the catalysts was done for the conversion of waste cooking oil using Ni-NH₂/SM and a mixture of Ni/SM+NH₂/SM catalyst. The results of liquid product for conversion of waste cooking oil was analyzed by gravimetric method and Gas Chromatography-Mass Spectrometry (GCMS).

The results showed that the mesoporous silica (SM) has structure characteristic as wormhole-like with pore diameter, specific surface area, pore volume respectively 4.9 nm, 666.76 m²/g, and 2.666 cm³/g. The results of waste cooking oil conversion using Ni-NH₂/SM and Ni/SM+NH₂/SM as catalysts are liquid products respectively 34.18% and 92.85% (w/w). The highest selectivity of gasoline fraction (29.95% w/w) produced by Ni/SM+NH₂/SM catalyst and the highest diesel fraction (63.35% w/w) produced by Ni-NH₂/SM catalyst.

Keywords : silica, mesoporous, catalyst, bifunctional, biofuel.