

SINTESIS KATALIS Ni/SAM, Fe/SAM, Fe-Ni/SAM DENGAN METODE SONOKIMIA DARI LUMPUR SIDOARJO TERCETAK GELATIN TULANG IKAN LELE UNTUK KONVERSI α -SELULOSA TERPIROLISIS

Chika Surya Deninta
14/365812/PA/16156

INTISARI

Penelitian tentang sintesis katalis Ni/SAM, Fe/SAM, Fe-Ni/SAM dengan metode sonokimia dari lumpur Sidoarjo tercetak gelatin tulang ikan lele untuk konversi α -selulosa terpirolisis telah dilakukan. Tujuan dari penelitian adalah mempelajari sintesis silika-alumina mesopori (SAM) dengan metode sonokimia yang bersumber dari silika dan alumina lumpur Sidoarjo dengan gelatin hasil ekstraksi tulang ikan lele sebagai cetakan, mempelajari pengaruh rasio pengembangan logam katalis dengan metode impregnasi basah terhadap porositas, keasaman, struktur dan morfologi, serta uji aktivitas katalis dalam proses konversi selulosa terpirolisis.

Penelitian diawali dengan mengekstraksi silika dan alumina lumpur Sidoarjo menggunakan metode refluks. Silika-alumina mesopori kemudian disintesis dengan rasio Si/Al 25 menggunakan gelatin hasil ekstraksi tulang ikan lele sebagai cetakan. Sintesis dilakukan selama 90 menit dengan metode sonokimia. SAM kemudian diimbaskan monologam Fe dan Ni dengan rasio 10% (b/b) dan bilogam Fe-Ni dengan rasio mol 1:1, 2:1, 3:1 menggunakan metode impregnasi basah. Material diuji keasamannya dan dikarakterisasi dengan *Fourier Transform Infrared Spectroscopy* (FTIR), *Inductively Coupled Plasma* (ICP), *Gas Sorption Analyzer* (GSA), *Transmission Electron Microscopy* (TEM), *X-ray Diffraction* (XRD) dan *Gas Chromatography Mass Spectrometry* (GC-MS).

Uji aktivitas katalis dilakukan dalam konversi selulosa terpirolisis. Hasil penelitian menunjukkan bahwa SAM memiliki rasio Si/Al sebesar 21,45. Keasaman katalis tertinggi terdapat pada Fe-Ni(2:1)/SAM sebesar 32,83 mmol/g. Luas permukaan, radius pori rata-rata dan total volume pori material katalis menurun dibandingkan dengan material pengembangan SAM yaitu sebesar 190,47 m²/g, 5,59 nm, 0,34 cm³/g. Konversi produk cair tertinggi dihasilkan pada katalis Fe-Ni(2:1)/SAM sebesar 91,79% (b/b). Katalis Fe-Ni(1:1)/SAM menunjukkan selektivitas katalitik terbaik, menghasilkan 1,3 pentadiena 0,39% (b/b) dari proses *hydrotreating*.

Kata kunci: biomassa, ekstraksi, karakterisasi, silika-alumina mesopori, sonokimia

SYNTHESIS OF Ni/MSA, Fe/MSA, Fe-Ni/MSA CATALYSTS WITH SONOCHEMISTRY METHOD FROM SIDOARJO MUD TEMPLATED BY CATFISH BONE'S GELATIN FOR PYROLYZED OF α -CELLULOSE CONVERSION

Chika Surya Deninta
14/365812/PA/16156

ABSTRACT

Synthesis of Ni/MSA, Fe/MSA, Fe-Ni/MSA catalysts with sonochemistry method from Sidoarjo mud templated by Catfish bone's gelatin for pyrolyzed of cellulose conversion had been done. This experiment was aimed to study synthesis mesoporous silica-alumina (MSA) using sonochemistry method from extraction silica and alumina Sidoarjo mud with gelatin fish bone as a template, to study the effect of metal ratio impregnation of catalyst against porosity, acidity, structure, morphology, selectivity for pyrolyzed of α -cellulose conversion.

The experiment was started with extraction silica and alumina from Sidoarjo mud with reflux method then it was synthesized with Si/Al ratio 25 using gelatin from catfish bone extraction as a template. The synthesis of mesoporous silica-alumina was using sonochemistry method within 90 minutes. Mesoporous silica-alumina then was impregnated by mono metal Ni or Fe with 10% ratio (b/b) MSA and bimetal Fe-Ni with variation mol ratio 1:1, 2:1, 3:1 using wet impregnation method. The materials then were characterized by Fourier Transform Infrared Spectroscopy (FTIR), Inductively Coupled Plasma (ICP), Gas Sorption Analyzer (GSA), Transmission Electron Microscopy (TEM), X-ray Diffraction (XRD), NH_3 -adsorption and also were evaluated their activity and selectivity for pyrolyzed of cellulose conversion with Gas Chromatography Mass Spectrometry (GC-MS).

The result showed that the MSA had Si/Al ratio of 21.45. Fe-Ni(2:1)/MSA had the highest acidity of the materials with the value of acidity 32.83 mmol/g. Specific surface area, pore diameter, and pore volume of the material catalysts were decreased from the material support. The specific surface area, pore diameter, and pore volume of MSA were $190.47 \text{ m}^2.\text{g}^{-1}$, 5.59 nm, 0.34 cc.g^{-1} , respectively. The highest activity for pyrolysis of cellulose conversion was obtained in Fe-Ni(2:1)/MSA catalysts with 91.79% (w/w) liquid fraction. Fe-Ni(1:1)/MSA catalyst was the best catalytic selectivity of the material catalyst, it was produced 0.39% 1,3 pentadiene (w/w) from hydrotreating process.

Keywords: biomass, extraction, characterization, mesoporous silica-alumina, sonochemistry