GREEN SINTESIS DAN UJI SIFAT FISIKOKIMIA ASETAL SIKLIK METIL 9,10-DIHIDROKSISTEARAT SEBAGAI BIOPELUMAS

Yehezkiel Steven Kurniawan
12/331591/PA/14783

INTISARI

Green sintesis dan uji sifat fisikokimia senyawa asetal siklik metil 9,10-dihidroksistearat (ASMDHS) sebagai biopelumas telah dilakukan. Tujuan penelitian ini adalah mempelajari reaksi esterifikasi antara asam 9,10-dihidroksistearat (DHSA) dan metanol dengan katalis montmorillonit KSF dan H_2SO_4 serta penggunaan metode refluks dan sonokimia. Selain itu juga diperlajari reaksi asetalisasi antara metil 9,10-dihidroksistearat (MDHS) dan pentanal dengan katalis montmorillonit KSF dan *p*TSA serta penggunaan metode refluks dan sonokimia serta mengetahui sifat fisikokimia produk biopelumas meliputi: densitas, viskositas dinamik, viskositas kinematik, indeks viskositas, angka asam total, angka basa total dan angka iodin. Mula-mula dilakukan konversi asam oleat menjadi DHSA dengan reaksi hidroksilasi pada temperatur 0-10 °C. Produk tersebut direaksikan lebih lanjut dengan metanol membentuk MDHS. Senyawa ASMDHS diperoleh dari reaksi antara MDHS dan pentanal. Tiap produk ditentukan strukturnya dengan spektrometer FTIR dan GC-MS.

Reaksi hidroksilasi asam oleat menghasilkan padatan putih DHSA dengan titik leleh 131,1-131,8 °C dan rendemen 46,52%. Reaksi esterifikasi senyawa DHSA dan metanol menghasilkan padatan putih MDHS, dimana hasil terbaik diperoleh dengan katalis H_2SO_4 baik dengan metode refluks maupun sonokimia dengan rendemen berturut-turut 93,94 dan 87,88%. Reaksi asetalisasi antara MDHS dan pentanal menghasilkan cairan kuning kental ASMDHS, dimana hasil terbaik diperoleh dengan katalis montmorillonit KSF baik dengan metode refluks maupun sonokimia dengan rendemen 79,15 dan 85,43%. Senyawa ASMDHS memiliki densitas 0,926 g/mL, viskositas dinamik pada 40 dan 100 °C yaitu 161,96 dan 16,36 cP, indeks viskositas 107,70, angka asam total 59,8 mg KOH/g, angka basa total 8,19 mg KOH/g dan angka iodin 0,13 mg I_2/g.

Kata kunci: asam oleat, asetal siklik metil 9,10-dihidroksistearat, biopelumas, *green* sintesis

GREEN SYNTHESIS AND PHYSICOCHEMICAL PROPERTIES TEST OF ACETAL CYCLIC METHYL 9,10-DIHYDROXYSTEARATE AS BIOLUBRICANT

Yehezkiel Steven Kurniawan
12/331591/PA/14783

ABSTRACT

The green synthesis and physicochemical properties test of cyclic acetal methyl 9.10-dihydroxystearate (ASMDHS) compound as biolubricant has been done. The aims of this research were to study esterification reaction between 9.10-dihydroxystearic acid (DHSA) and methanol with montmorillonite KSF and H_2SO_4 catalysts via reflux and sonochemistry method, to study acetalization reaction between methyl 9.10-dihydroxystearate (MDHS) and pentanal in the presence of montmorillonite KSF and *p*TSA as catalysts through reflux and sonochemistry method, and to know lubricant physicochemical properties like density, dinamic viscosity, kinematic viscosity, viscosity index, total acid number, total base number and iodine value. At the beginning, oleic acid was hydroxylated at 0-10 °C to gave DHSA, and then it was reacted with methanol to form MDHS. The ASMDHS compound was obtained from reaction between MDHS and pentanal. The structure of each products were identified by FTIR and GC-MS.

Hydroxylation reaction of oleic acid gave white solid of DHSA with melting point 131.1-131.8 °C in 46.52% yield. Esterification reaction of DHSA with methanol gave MDHS as white solid, where the best results were obtained with H_2SO_4 catalyst through reflux and sonochemistry method in 93.94 and 87.88% yield. Acetalization reaction of MDHS with pentanal gave yellow viscous liquid of ASMDHS, where the best results were obtained with montmorillonite KSF catalyst through reflux and sonochemistry method in 79.15 and 85.43% yield. The ASMDHS compound has density of 0.926 g/mL, dinamic viscosity at 40 and 100 °C of 161.96 and 16.36 cP, viscosity index of 107.70, total acid number of 59.8 mg KOH/g, total base number of 8.26 mg KOH/g and iodine value of 0.13 mg I_2/g.

Keywords: cyclic acetal methyl 9.10-dihydroxystearate, biolubricant, green synthesis, oleic acid