ABSTRAK

Green diesel sebagai salah satu bahan bakar alternatif memiliki potensi besar dalam pengurangan emisi CO_2 dari sektor transportasi. Penelitian ini bertujuan untuk mengamati pengaruh katalis Ni/ZIF-67 dan Cu/ZIF-67 pada reaksi deoksigenasi asam laurat menjadi hidrokarbon. ZIF-67 disintesis melalui proses pengadukan senyawa $Co(NO_3)_2.6H_2O$, 2MI, DEA and MeOH pada suhu ruang. Penambahan logam Ni dan Cu pada ZIF-67 menggunakan metode impregnasi basah. Katalis dikarakterisasi berdasarkan TGA, TPD NH_3, XRD, FTIR, BET, SEM-EDX. Uji aktivitas katalitik melalui reaksi deoksigenasi asam laurat dilakukan pada kondisi operasi suhu 350ºC, durasi 4 jam dan tekanan H_2 20 bar. Hasil XRD dan FTIR menunjukkan karakteristik ZIF-67 terdapat pada Ni/ZIF-67 dan Cu/ZIF-67 berdasarkan *peak* kristalinitas dan gugus fungsi. Kalsinasi dan reduksi membuat ZIF-67 berubah menjadi Co_3O_4 dan CoO. Luas permukaan ZIF-67 mengalami penurunan cukup siginifikan akibat penambahan logam Ni dan Cu serta efek suhu kalsinasi-reduksi. Tingkat keasamaan katalis secara berurutan yaitu Ni/ZIF-67 > ZIF-67 > Cu/ZIF-67. Hasil EDX menunjukkan keberhasilan impregnasi Ni dan Cu pada ZIF-67 berdasarkan spektrum dan pemetaan unsur. ZIF-67, Ni/ZIF-67 dan Cu/ZIF-67 mengkonversi asam laurat sebesar >99%. ZIF-67 menghasilkan *yield* C_{11} sebesar 34.35% dan C_{12} sebesar 14.99%. Ni/ZIF-67 menunjukkan *yield* tertinggi C_{11} dan C_{12} secara berurutan yaitu 45.3% dan 15.17%. Sedangkan, *yield* tertinggi C_{11} pada Cu/ZIF-67 sebesar 67.42% dan 16.41% untuk C_{12}.

Kata kunci : deoksigenasi, hidrokarbon, asam laurat, Ni/ZIF-67, Cu/ZIF-67

ABSTRACT

Green diesel as an alternative fuel has great potential in reducing CO_2 emissions from the transportation sector. This study aims to observe the effect of Ni/ZIF-67 and Cu/ZIF-67 catalysts on the deoxygenation of lauric acid into hydrocarbons. ZIF-67 was synthesized by stirring $Co(NO_3)_2.6H_2O$, 2MI, DEA and MeOH at room temperature. Impregnation of Ni and Cu metals into ZIF-67 was done by wet impregnation method. All synthesized catalyst were characterized by means of TGA, TPD NH_3, XRD, FTIR, BET, and SEM-EDX. The catalytic activity test through lauric acid deoxygenation was carried out at temperature of 350ºC, duration of 4 hours and pressure of 20 bar H_2. Based on XRD and FTIR analysis, the characteristic of ZIF-67 was observed in both Ni/ZIF-67 and Cu/ZIF-67 in terms of peak crystallinity and functional groups. Calcination and reduction changed ZIF-67 to Co_3O_4 and CoO. The surface area of ZIF-67 decreased significantly due to the addition of Ni and Cu metals and the effect of calcination-reduction temperature. The acidity level of the catalyst sequentially is Ni/ZIF-67 > ZIF-67 > Cu/ZIF-67. The EDX results showed Ni and Cu well impregnated in ZIF-67 based on spectra and elemental mapping. ZIF-67, Ni/ZIF-67 and Cu/ZIF-67 contributed >99% conversion of lauric acid. ZIF-67 produced yield of C_{11} of 34.35% and C_{12} of 14.99%. Ni/ZIF-67 showed the highest yield of C_{11} and C_{12} respectively, namely 45.3% and 15.17%. Meanwhile, the highest yield of C_{11} on Cu/ZIF-67 was 67.42% and 16.41% for C_{12}.

Keywords: deoxygenation, hydrocarbon, lauric acid, Ni/ZIF-67, Cu/ZIF-67