Pengaruh tekanan gas hidrogen pada hidrodeoksigenasi trigliserida dengan pelarut pirolisat polipropilena dan katalis Ni-Cu/ZrO2 terhadap komposisi biofuel = Effect of hydrogen gas pressure on triglyceride hydrodeoxygenation with polypropylene pyrolyzate solvent and Ni-Cu/ZrO2 catalyst on biofuel composition

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Abstrak

Crude Palm Oil (CPO) dapat diproses melalui pirolisis menghasilkan bio-oil yang membutuhkan upgrading untuk mengubah bio-oil menjadi biofuel salah satunya melalui hidrodeoksigenasi (HDO). Penelitian lanjut mengenai pengaruh tekanan gas hidrogen (H2) terhadap reaksi HDO dengan komponen umpan olahan CPO serta pirolisat Polypropylene (PP) termal dilakukan untuk meningkatkan pemahaman komprehensif terhadap variabel reaksi HDO pada produksi biofuel dengan metode umpan gas H2 dan pelarut yang berbeda. HDO katalitik campuran 50% Refined Bleached Deodorized Palm Oil (RBDPO) dan 50% pirolisat PP termal- juga berperan sebagai pelarut- dengan katalis Ni-Cu/ZrO2 dilakukan pada variasi tekanan 8-14 bar gas H2 menggunakan reaktor hidrogenasi self-induced impeller. Katalis Ni-Cu/ZrO2 hasil preparasi penelitian berukuran mesopori dengan ukuran kristal 33,95 nm, luas permukaan spesifik 8,04 m2/g, dan konsentrasi situs basa sebesar 0,38 mmol/g memiliki stabilitas termal yang rendah serta interaksi Ni dengan metal-oxide lemah karena keberadaan pengotor dan Ni-Cu yang kurang terimpregnasi pada pengemban ZrO2. Tekanan gas H2 memengaruhi perubahan komposisi ke arah biodiesel dengan peningkatan komposisi alkana dan olefin serta penurunan komposisi sikloalkana, alkohol, asam karboksilat, dan keton sepanjang 10 - 14 bar gas H2 di samping keberadaan data outlier pada 8 bar gas H2. Yield fraksi cair maksimal 55-65% dengan peningkatan yield solid campuran wax dan sludge dari komponen umpan serta penurunan yield NCG seiring peningkatan tekanan gas H2 didapatkan. Rasio komponen PP dan RBDPO sebagai umpan pada reaksi HDO menghasilkan yield biofuel tertinggi pada 50% PP dan 50% RBDPO. Keuntungan kemampuan dispersi partikel gas H2 pada self-inducing impeller reaktor HDO tidak dapat menanggulangi rendahnya solubilitas gas H2 pada pelarut pirolisat PP termal.

.....Crude Palm Oil (CPO) can be processed through pyrolysis to produce bio-oil which requires upgrading to convert bio-oil into biofuel, one of which is through hydrodeoxygenation (HDO). Further research on the effect of hydrogen gas pressure (H2) on HDO reactions with processed CPO feed components and thermal Polypropylene (PP) pyrolyzate was carried out to improve a comprehensive understanding of HDO reaction variables in biofuel production with H2 gas feed methods and different solvents. The catalytic HDO mixture of 50% Refined Bleached Deodorized Palm Oil (RBDPO) and 50% thermal PP pyrolyzate- also acts as a solvent- with a Ni-Cu/ZrO2 catalyst carried out at a pressure variation of 8-14 bar H2 gas using a self-induced impeller hydrogenation reactor. The Ni-Cu/ZrO2 catalyst as a result of the research preparation is mesoporous with a crystal size of 33.95 nm, a specific surface area of ââ8.04 m<2/g, and a base site concentration of 0.38 mmol/g. It has low thermal stability and the interaction of Ni with metal. -oxide is weak due to the presence of impurities and poorly impregnated Ni-Cu on the support. The pressure of H2 gas affects the composition change towards biodiesel by increasing the composition of alkanes and olefins and decreasing the composition of cycloalkanes, alcohols, carboxylic acids, and ketones along 10 - 14 bar of

H2 gas in addition to the presence of outlier data at 8 bar of H2 gas. Maximum liquid fraction yield is 55-65% with an increase in yield of solid mixture of wax and sludge from the feed component and a decrease in NCG yield as H2 gas pressure increases. The ratio of PP and RBDPO components as feed in the HDO reaction resulted in the highest biofuel yields at 50% PP and 50% RBDPO. The advantage of H2 gas particle dispersion ability in the self-inducing impeller of the HDO reactor cannot overcome the low solubility of H2 gas in the thermal PP pyrolyzate solvent.