

Pengaruh Kecepatan Putar Pengaduk terhadap Karakteristik Biofuel pada Reaksi Hidrogenasi Fraksi Non-Oksigenat Bio-oil = The Effect of Stirrer's Speed on Characteristics of Biofuel in Hydrogenation of Bio-oil's Non-Oxygenated Fraction

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Abstrak

Stabilitas termal dan nilai kalor yang rendah serta korosivitas yang tinggi menjadi alasan perlu dilakukan upgrading bio-oil hasil pirolisis melalui hidrogenasi. Pada penelitian ini, bio-oil dihasilkan melalui slow co-pyrolysis bonggol jagung dan polipropilena untuk memperoleh yield dan fraksi non-oksigenat yang tinggi. Pemisahan fasa oksigenat dari bio-oil selanjutnya dilakukan untuk mengurangi beban katalitik proses hidrogenasi. Penelitian ini melangsungkan reaksi hidrogenasi fraksi non-oksigenat bio-oil dalam reaktor tangki berpengaduk berkatalis Ni/Al₂O₃ pada tekanan 8 bar dan temperatur 184oC. Tujuannya adalah untuk menjenuhkan ikatan rangkap sehingga dihasilkan biofuel dengan kandungan ikatan rangkap, branching index, viskositas, dan nilai kalor mendekati diesel. Pengaruh kecepatan putar pengaduk terhadap karakteristik biofuel selanjutnya diinvestigasi pada rentang 350 s.d. 800 rpm. Hasil penelitian menunjukkan bahwa peningkatan kecepatan putar pengaduk berdampak pada penurunan kandungan ikatan rangkap serta peningkatan derajat percabangan, berat molekul, nilai kalor, dan viskositas biofuel. Biofuel yang dihasilkan melalui hidrogenasi dengan kecepatan putar 800 rpm menghasilkan kualitas mendekati diesel dalam hal distribusi berat molekul, kandungan alkena (0%), dan HHV (47,22 MJ/kg). Namun, parameter branching index dan viskositas yang masing – masing bernilai 1,392 dan 11,85 cSt belum mendekati karakteristik diesel.....Low thermal stability and heating value as well as high corrosivity requires pyrolytic bio-oil to undergo upgrading through hydrogenation. In this work, bio-oil is produced by slow co-pyrolysis of corncobs and polypropylene to give high yield and high amount of non-oxygenated fraction. Oxygenated phase separation from bio-oil is then conducted to reduce catalytic load for hydrogenation. This work performs hydrogenation of bio-oil's non-oxygenated fraction in a stirred tank reactor equipped with Ni/Al₂O₃ catalyst under condition of 8 bar and 184oC. The aim is to saturate alkene to produce biofuel with alkene content, branching index, viscosity, and heating value approaching that of diesel fuel. The effect of stirrer's speed on biofuel's characteristics is then investigated in the range of 350 to 800 rpm. Result shows that the increase of stirrer's speed gives effects on the decrease of vinyl content as well as increase of branching index, molecular weight, heating value, and viscosity. Biofuel produced by hydrogenation under 800 rpm has quality approaching that of diesel fuel in terms of molecular weight distribution, vinyl content (0%), and HHV (47.22 MJ/kg). However, branching index and viscosity, which are respectively 1.392 and 11,85 cSt, have not been able to reach diesel's characteristics yet.