Analisis NMR Bio-oil dari Co-pyrolysis Minyak Sawit Curah dan Plastik Polipropilena = NMR Analysis of Bio-oil from the Co-pyrolysis of Bulk Palm Oil and Polypropylene Plastics

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Abstrak

Bio-oil hasil produksi dari co-pyrolysis CPO-PP tidak dapat langsung digunakan sebagai bahan bakar untuk mesin karena masih mengandung oksigenat yang cukup banyak, korosif, dan tidak stabil. Pada penelitian ini, katalis ZrO2/-Al2O3-TiO2 diharapkan dapat memperbaiki karakteristik bio-oil dan menciptakan bahan bakar yang memiliki karakteristik mendekati bahan bakar komersial. Katalis disintesis dengan suhu variasi suhu kalsinasi 1150oC dan laju pemanasan 7oC/menit. Pada proses catalytic co-pyrolysis dilakukan variasi komposisi polipropilena pada umpan yang digunakan (0%PP, 50%PP, dan 90%PP) dengan memasukkan katalis sebanyak 15% dari total umpan. Penelitian ini dilakukan menggunakan reaktor tangki berpengaduk dengan jumlah umpan 200 gram, kecepatan pemanasan 10oC/menit, suhu pirolisis 550oC, kecepatan pengadukan 80 rpm, dan laju alir gas nitrogen 100 ml/menit. Produk bio-oil terbaik dihasilkan pada variasi 50%PP dengan yield bio-oil sebesar 50%. Penggunaan katalis ZrO2/-Al2O3-TiO2 dapat meningkatkan produksi alkana dan alkena dengan menurunkan kandungan asam karboksilat dan keton di dalam biofuel. Hal ini menunjukkan bahwa penggunaan katalis mampu memaksimalkan reaksi deoksigenasi, Berdasarkan analisis GC-MS, H-NMR, dan C-NMR senyawa yang paling dominan adalah alkana dan alkena.
.....Bio-oil produced from co-pyrolysis CPO-PP cannot be used directly as fuel for engines because it still contains a lot of oxygenate, is corrosive, and unstable. In this study, the ZrO2 / -Al2O3-TiO2 catalyst is expected to improve the characteristics of bio-oil and create a fuel that has characteristics close to commercial fuels. The catalyst was synthesized with calcination temperature variations of 1150oC and heating rates of 7oC/minute. In the catalytic co-pyrolysis process, variations in the composition of polypropylene in the feed is used (0% PP, 50% PP, and 90% PP) and were carried out by adding a catalyst as much as 15% of the total feed. This research was conducted using a stirred tank reactor with a feed amount of 200 grams, heating rate 10oC/minute, pyrolysis temperature 550oC, stirring speed 80 rpm, and nitrogen gas flow rate of 100 ml/minute. The best bio-oil products are produced in variations of 50% PP with a bio-oil yield of 50%. The use of ZrO2/-Al2O3-TiO2 catalysts can increase the production of alkanes and alkenes by reducing the carboxylic acid and ketone content in biofuels. This shows that the use of a catalyst is able to maximize the deoxygenation reaction. Based on the GC-MS, H-NMR, and C-NMR analysis the most dominant compounds are alkanes and alkenes.