DEOKSIGENASI MINYAK JELANTAH MENGGUNAKAN KATALIS Cu-Bi/CaO BERBASIS TULANG SOTONG (*Sepia offinalis*) UNTUK PEMBUATAN *SUSTAINABLE AVIATION FUEL* (SAF)

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INTISARI

DEOKSIGENASI MINYAK JELANTAH MENGGUNAKAN KATALIS Cu-Bi/CaO BERBASIS TULANG SOTONG (*Sepia offinalis*) UNTUK PEMBUATAN *SUSTAINABLE AVIATION FUEL* (SAF)

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Permintaan energi terbarukan yang terus meningkat di sektor penerbangan mendorong pemanfaatan minyak jelantah sebagai bahan baku dalam produksi *sustainable aviation fuel* (SAF), yang berpotensi menurunkan emisi di sektor penerbangan. Produksi SAF dapat dilakukan melalui proses deoksigenasi, dimana katalis memegang peranan penting dalam menentukan efisiensi dan selektivitas reaksi. Penelitian ini bertujuan untuk mempelajari kinerja katalis bimetalik Cu-Bi/CaO dalam proses deoksigenasi. Katalis disintesis melalui impregnasi basah pada support CaO berbasis tulang sotong dengan variasi kadar logam, lalu dikarakterisasi menggunakan XRD, TPD-CO_2, TPD-NH_3, dan SAA. Selanjutnya, proses deoksigenasi dilakukan dalam atmosfer nitrogen pada suhu 350°C selama 2 jam dengan penggunaan 3 wt% katalis dan 13,3 g minyak jelantah dalam reaktor *semi-batch*. Produk hasil reaksi kemudian dianalisis menggunakan GC-FID. Hasil karakterisasi katalis menunjukkan bahwa katalis Cu(10%)–Bi(10%)/CaO menunjukkan performa tertinggi dalam reaksi deoksigenasi dengan *yield* sebesar 57.74%, yang didukung oleh terbentuknya fasa aktif CuO dan Bi_2O_3, serta sifat keasaman dan kebasaan yang sinergis berdasarkan analisis TPD. Aktivitas katalitiknya dibuktikan melalui hasil GC-FID yang menunjukkan dominasi fraksi hidrokarbon C8–C16 sesuai spesifikasi SAF. Performa ini semakin diperkuat melalui studi optimasi reaksi yang menghasilkan *yield* tertinggi sebesar 79,09% pada suhu 360 °C, waktu reaksi 4 jam, dan konsentrasi katalis 10%. Hasil ini menunjukkan bahwa katalis Cu-Bi/CaO berbasis tulang sotong berpotensi untuk diaplikasikan dalam produksi SAF.

***Kata Kunci** : Tulang sotong, sustainable aviation fuel (SAF), minyak jelantah, deoksigenasi, katalis Cu-Bi/CaO*

ABSTRACT

DEOXYGENATION OF WASTE COOKING OIL OVER Cu-Bi/CaO CATALYST DERIVED FROM CUTTLEFISH BONE (Sepia officinalis) FOR PRODUCTION OF SAF

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The increasing demand for renewable energy in the aviation sector has driven the utilization of waste cooking oil as a feedstock for the production of sustainable aviation fuel (SAF), offering the potential to reduce aviation-related emissions. SAF production can be achieved through the deoxygenation process, in which catalysts play a critical role in determining the efficiency and selectivity of the reaction. This study aims to study the performance of a bimetallic Cu-Bi/CaO catalyst in the deoxygenation process. The catalyst was synthesized via wet impregnation on a CaO support derived from cuttlefish bone, with variations in metal loading, and subsequently characterized using XRD, CO_2-TPD, NH_3-TPD, and SAA analyses. The deoxygenation reaction was carried out in a nitrogen atmosphere at 350 °C for 2 hours using 3 wt% catalyst and 13.3 g of used cooking oil in a semi-batch reactor. The resulting products were analyzed using GC-FID. Catalyst characterization revealed that Cu(10%)–Bi(10%)/CaO exhibited the highest performance in the deoxygenation reaction with 57.74% yield, supported by the formation of active CuO and Bi_2O_3 phases and strong acidity-basicity properties as indicated by TPD. Catalytic activity was further confirmed by GC-FID results, which showed a predominance of C8–C16 hydrocarbon fractions consistent with SAF specifications. This performance was enhanced by reaction optimization, which yielded a maximum product yield of 79.09% at 360°C, 4 hours of reaction time, and 10% catalyst concentration. These findings suggest that the Cu-Bi/CaO catalyst derived from cuttlefish bone is promising candidate for application in SAF production.

Keywords : *Cuttlefish bone, Sustainable aviation fuel (SAF), Waste cooking oil, Deoxygenation, Cu-Bi/CaO catalyst.*