The improvement in the properties of fatty acid methyl ester using partial hydrogenation reaction in a continuous fixed-bed reactor

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Abstract: This research studied the improvement in the properties of fatty acid methyl ester (FAME), produced from palm biodiesel via partial hydrogenation reaction in a continuous fixed-bed reactor. The palm biodiesel was mixed with hydrogen before the liquid-gas mixture was fed into the reactor. The partial hydrogenation reaction was catalyzed using packed commercial Pd/Al₂O₃ as the catalyst. Several parameters for the improvement in the properties of FAME were studied such as reaction temperatures (80, 100 and 120 °C), catalyst weights (2, 2.5 and 3 g) and the flow rate of palm biodiesel (0.19 and 0.38 mL/min). After the reaction, the properties of palm biodiesel were measured using gas chromatography (GC), in order to study the composition and the change in the structure of fatty acid and glyceride. The result showed that the partial hydrogenation reaction was able to improve the properties of palm biodiesel. The suitable condition for partial hydrogenation reaction in the continuous fixed-bed reactor was carried out using reaction temperature of 80 °C, catalyst weight of 2.5 g and flow rate of palm biodiesel of 0.38 mL/min. This condition resulted in the decrease of polyunsaturated FAME contents more than 85%, while saturated monoglyceride contents increased more than 80%.

Keywords: Partial hydrogenation; Continuous fixed-bed reactor; FAME