ABSTRACT

THE SIGNIFICANCE OF IN-SITU HYDROGEN IRON (FE) IN THE HYDROTREATING OF WASTE COOKING OIL TO ENHANCE GREEN DIESEL SELECTIVITY

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The global energy crisis due to heavy reliance on fossil fuels and the increasing volume of waste cooking oil has encouraged the development of environmentally friendly alternative fuels. This study aims to produce green diesel from used cooking oil through a hydrotreating process using NiMo/γ-Al_2O_3 catalyst and in-situ hydrogen donor based on iron (Fe) at concentrations of 5%, 10%, and 15%, with temperature variations of 340°C, 370°C, 400°C, and 430°C. The analysis focused on yield, selectivity of the C15–C18 hydrocarbon fraction, and specific energy consumption (SEC). Results showed that increasing Fe concentration and reaction temperature up to the optimal point enhanced both yield and product selectivity. The highest yield was obtained at 15% Fe and 400°C, while optimal selectivity was achieved at 10% Fe and 370°C. The most efficient SEC was recorded at 15% Fe in the 370–430°C range. GC-MS analysis revealed dominant hydrocarbon fractions of C19–C20 (37.54%) and C15–C18 (29.37%), aligning with green diesel characteristics. This study demonstrates that in-situ hydrogen donation using Fe effectively enhances the efficiency and quality of green diesel production from waste cooking oil, supporting renewable energy development and sustainable waste management.

***Keywords**: Green diesel, waste cooking oil, hydrotreating, in-situ hydrogen donor, iron (Fe), NiMo/γ-Al_2O_3, selectivity, yield, specific energy consumption (SEC), renewable energy.*