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Parametric Study of Biodiesel Production from Used Soybean Oil

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Abstract: Biodiesel, an alternative diesel fuel derived from vegetable oil, animal fat, or waste vegetable oil (WVO), is obtained by reacting the oil or fat with an alcohol (transesterification) in the presence of a basic catalyst to produce the corresponding mono-alkyl esters. In this work, the effect of the catalyst KOH-to-WVO ratio, ethanol concentration, and time of reaction on the biodiesel yield were investigated. The transesterification reaction was performed at a constant temperature (35 7C) in order to minimize the cost of heating and ethanol evaporation. A 23 complete factorial design on biodiesel yield (Y) was performed using low and high levels of operating variables: KOH concentration (9?14 g/L), ethanol concentration (30?40 vol-%) and time (30?40 min). The complete factorial model that can be used to fit the data was determined. The model shows that interactions exist among the parameters and that the parameters, or factors, do not operate independently on the response (biodiesel yield). The highest yield was obtained in the first 30 min of reaction time. The results indicate that the highest yield was 78.5 vol-% using a KOH-to-WVO ratio of 12 g/L and 30 vol-% ethanol. The ASTM tests indicate that the biodiesel properties are within the biodiesel standard limits.