

EFFECT OF ULTRASOUND MIXING ON ESTERIFICATION OF FFA IN RUBBER SEED OIL

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ABSTRACT

There is an increasing demand for biodiesel, because of its environmental friendly nature and especially due to the depletion of petroleum reserves. Currently, most of the biodiesel is produced from edible oils under base catalyzed transesterification. However, large amount of non edible oils are underutilized and can be converted to biodiesel. The difficulty with base catalyzed transesterification of non edible oil is its higher content of free fatty acids. These free fatty acids react with base catalyst to produce soap and which prevent the separation of ester from the glycerin.

The reduction of free fatty acid content of rubber seed oil under catalyzed esterification with ultrasonic mixing (20 kHz, 500 W) was investigated in this study and compared with mechanical agitation. Batch esterification of rubber seed oil was carried out using 2.5:1 (w/w) methanol/ FFA and 0.05:1 (w/w) H₂SO₄/FFA and effect of ultrasound frequency, reaction temperature and reaction time were studied. With the increase of ultrasonic amplitude, mixing intensity was increased and as a result, maximum FFA% reduction of 88.9 observed at the amplitude of 75% and at a temperature of 55°C. When the esterification reaction carried out at elevated temperatures, it shows a greater reduction of FFA% under ultrasonic and mechanical mixing. However, optimum result was gained under mechanical mixing at the temperature of 55°C and at a reaction time of 30 min and the final FFA% of rubber seed oil was 2.75. At the same reaction conditions, acid esterification of rubber seed oil under ultrasonic mixing achieved a FFA% of 3.31.

Keywords: Biodiesel, FFA, esterification, ultrasonic mixing, Sri Lanka.



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LIST OF ABBREVIATIONS

Abbreviation	Description
ASTM D 6751	American Society for Testing and Materials
Btu	British thermal unit
B100	Pure Biodiesel
DG	Diglycerides
FAEE	Fatty Acid Ethyl Ester
FFA	Free Fatty Acids
FAME	Fatty Acid Methyl Ester
MG	Monoglycerides
RSO	Rubber Seed Oil
TG	Triglycerides
WEO	Waste Edible Oil



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