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Biodiesel Production from Waste Cooking Oil Using Sulfuric Acid and Microwave Irradiation Processes

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ABSTRACT

A comparative study of biodiesel production from waste cooking oil using sulfuric acid (Two-step) and microwave-assisted transesterification (One-step) was carried out. A two-step transesterification process was used to produce biodiesel (alkyl ester) from high free fatty acid (FFA) waste cooking oil. Microwave-assisted catalytic transesterification using BaO and KOH was evaluated for the efficacy of microwave irradiation in biodiesel production from waste cooking oil. On the basis of energy consumptions for waste cooking oil (WCO) transesterification by both conventional heating and microwave-heating methods evaluated in this study, it was estimated that the microwave-heating method consumes less than 10% of the energy to achieve the same yield as the conventional heating method for given experimental conditions. The thermal stability of waste cooking oil and biodiesel was assessed by thermogravimetric analysis (TGA). The analysis of different oil properties, fuel properties and process parametric evaluative studies of waste cooking oil are presented in detail. The fuel properties of biodiesel produced were compared with American Society for Testing and Materials (ASTM) standards for biodiesel and regular diesel.

KEYWORDS

Biodiesel; Waste Cooking Oil; Free Fatty Acid; Sulfuric Acid; Microwave-Assisted Transesterification

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