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Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

FINAL YEAR PROJECT REPORT

EXTRACTION AND CHARACTERIZATION OF BIODIESEL FROM MANGO SEED KERNEL OIL

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ABSTRACT

Biodiesel is a renewable source of energy that can be used as an alternative to the fossil fuels which are non-renewable, expensive and are more environmental degrading due to excessive emissions produced during combustion in the diesel engines. Biodiesel is a mono alkyl ester of fatty acids derived from vegetable oils and animal fats and waste cooking oil and it has similar combustion properties to regular fossil diesel fuel. Biodiesel is biodegradable, nontoxic, and has significantly fewer emissions than petroleum-based diesel when burned. This paper provides more insight about the extraction and characterization of biodiesel from mango seed kernel oil.

Mango seed kernel oil is oil that is obtained from the seed kernels by extraction, it contains 44.0% moisture, 6.0% protein, 12.8% fat, 32.8% carbohydrates. The percentage of the fat content provides the potential of the oil to produce biodiesel. The process of biodiesel extraction is called transesterification and it includes a reaction of a vegetable oil with an alcohol using a catalyst. This chemical reaction converts an ester (vegetable oil or animal fat) into a mixture of esters of the fatty acids that makes up the oil (or fat). The alcohol used in this research was Methanol and the catalyst was Potassium Hydroxide (KOH). The properties studied in this research were; the cetane number, Iodine value, saponification value, acid value, flash point, cloud and pour point, methanol content, total glycerol, kinematic viscosity and others.

Biodiesel can be blended into fossil diesel in different ratios like B20, B40 in order to reduce on high emissions caused by the fossil fuels, and also to reduce on the high costs on the fossil fuels since there are no engines which purely run on the biofuels.

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DEDICATION

This report is dedicated to my family members and my fellow students of Agro-processing Engineering for the great support rendered to me during the compilation of this piece of work. I also devote the work of this research report to my supervisor who guided and supported me in developing my research project.

DECLARATION

I **Were Joseph** affirm that this report is my original work which I have developed about my project title, and it has been compiled out of my great effort and it has never been presented by any student. No part of this publication may be reproduced in any form by any means, electronic or mechanical, including photocopying, or any information storage without permission in writing from the publisher.

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APPROVAL

This is to certify that the report is a creation and compilation of **Were Joseph** and is ready for submission to the respective institution.

Supervisor

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CHAPTER ONE

1.0 Introduction

This chapter describes the background information of the project, the problem statement, justification, purpose, objectives and the scope of the study. The problem statement describes the problem of the study and the solution. The justification describes the importance of the project and the specific objectives which help to achieve the main objective.

1.1 Background of the study

The dependence on fossil fuels as the only source of energy comes at a high cost and the world petroleum production has perhaps reached its peak (Watson et, al, 2011). Experts suggested that existing oil and gas reserves would only last for a few additional years. Besides emissions from the burning of these fuels such as Carbon dioxide, Carbon monoxide, Nitrogen Oxide and sulfur containing residues are the principal causes of global warming (Sharma, et, al, 2001). This has stimulated the widespread search for a cheap and an eco- friendly alternative source (Monteiro et al., 2008). Biofuels offer a partial solution to many of these problems. The feed stocks for biofuel production are produced by domestic agriculture, which means that Biofuel production occurs domestically (Mba, et, al, 2015). In order to meet the rising energy demand and diminishing petroleum reserves; fuels such as biodiesel and bioethanol, are in the forefront of alternative technologies under development. Accordingly, the viable alternative for the compression-ignition engines is biodiesel (Kaieda et al., 1999).

Biodiesel is a mono alkyl ester of fatty acids derived from vegetable oils and animal fats; it is a clean and renewable fuel. Biodiesel is one of the most attractive biofuels because of its biodegradability, higher flash point, reduced exhaust emissions, miscibility in all ratios with petroleum diesel, compatibility with the existing fuel distribution infrastructure and inherent lubricity (Hossain and Mekhled, 2010). Other attractive features of biodiesel include; non flammability, non-toxic, reduced petroleum imports, low sulphur content, domestic production and oxygenating potentials (Komers et al, 2002).

Various vegetable oils (edible or non-edible) and animal fats used for biodiesel production are rice bran oil, coconut oil, Jatropha curcas oil, castor oil, cotton seed oil, palm oil, olive oil, palm kernel oil, soybeans oil, sunflower oil, canola oil, tallow, waste grease, peanut oil, corn oil, fish

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