

**PRODUCTION OF BIODIESEL USING WASTE COOKING OIL VIA
TRANSESTERIFICATION PROCESS**

AHMAD HUSSAIRI BIN ABDUL RAHMAN

**Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Applied Chemistry
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

OCTOBER 2008

This Final Year Project Report entitled “**Production of Biodiesel using Waste Cooking Oil via Transesterification process**” was submitted by Ahmad Hussairi bin Abdul Rahman, in partial fulfillment of the requirements for the Degree of Bachelor of Science (Hons.) Applied Chemistry, in the Faculty of Applied Sciences, and was approved by



Pn. Haliza Kassim
Supervisor
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor



Ms. Sabrina binti M. Yahaya
Project Coordinator
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor



Dr. Yusairie bin Mohd.
Head of Programme
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
40450 Shah Alam
Selangor

Date: _____

ACKNOWLEDGEMENTS

Alhamdulillah, praise be to Allah S.W.T, the most beneficent and most merciful for giving me the opportunity, ability and strength to complete this studies and thesis.

First of all, I would like to thank my supervisor, Puan Haliza Binti Kassim, for giving me the chance to work in the field of oleo chemical. Her dedication and commitment to my works will always be appreciated and remembered. Without your support, this thesis might not be completed.

Special thanks and appreciation to my beloved family and friends, who have endured this long process with me and always offered me support, encouragement and love.

Finally, my appreciation goes to those who have been, directly or indirectly involved in the preparation and accomplishment of this studies. Thank you all for the encouragement and cooperation given to me.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS	viii
ABSTRACT	ix
ABSTRAK	x
CHAPTER 1: INTRODUCTION	
1.1 Background and problem statement	1
1.2 Significant of study	2
1.3 Objectives of study	3
CHAPTER 2: LITERATURE REVIEW	
2.1 Definition of Biodiesel	4
2.2 Sources of Biodiesel	7
2.3 Advantages of Biodiesel	9
2.3.1 Availability and renewability of biodiesel	10
2.3.2 Higher combustion efficiency of biodiesel	10
2.3.3 Lower emissions by using biodiesel	12
2.3.4 Biodegradability of biodiesel	16
2.4 Disadvantages of using biodiesel	18
2.5 Biodiesel economy	20
2.6 Environmental impact of biodiesel	22
CHAPTER 3: METHODOLOGY	
3.1 Materials and reagents	24
3.2 Method	24
3.2.1 Removing of water in the waste cooking oil	25
3.2.2 Titration	25
3.2.3 Measuring the lye	26
3.2.4 Mixing the methoxide	26
3.2.5 Transesterification process	26
3.2.6 Settling	27
3.3 Identifying fatty acid composition	27
3.4 Analysis of energy content	27
3.5 Analysis of viscosity	27

ABSTRACT

PRODUCTION OF BIODIESEL FROM WASTE COOKING OIL VIA TRANSESTERIFICATION PROCESS

Biodiesel is a non-toxic; biodegradable diesel fuel made from vegetable oils, animal fats, and used or recycled oils and fats. Waste cooking oil is an example of raw material that meets the requirement to make biodiesel. In this study, biodiesel is produced via transesterification process. Methanol is used as the reactant. Catalysts used are Sodium Hydroxide and Potassium Hydroxide. Transesterification process converts triacylglycerols to methyl ester. The major components of vegetable oils and animal fats are triacylglycerols (TAG often also called triglycerides). Chemically, TAG is esters of fatty acids (FA) with glycerol. The TAG of vegetable oils and animal fats typically contain several different fatty acids. Thus, different fatty acids can be attached to one glycerol backbone. Parameter such as temperature, the type of reactant, amount and type catalyst used in this study is carefully manipulated. All the parameter is dependent on each other and efficiency of transesterification process is based on these parameters. The yield of biodiesel obtained from this study is 32.85 % for biodiesel produced using Sodium Hydroxide as catalyst and 36.1 % for biodiesel produced using Potassium Hydroxide as catalyst. Qualitative analysis of biodiesel is determined by using gas chromatography. It is done by comparing the retention time of individual standard with the retention time of the sample. The standard of fatty acid used in this study is Lauric, Myristic, Palmitic, Stearic and Oleic. The GC had detected fatty acid Palmitic, Stearic and Oleic from biodiesel produced using Sodium Hydroxide as catalyst and fatty acid Lauric, Palmitic, Stearic and Oleic from biodiesel using Potassium Hydroxide as catalyst. Energy content is an important aspect in determining the combustion properties of fuel. Energy content of biodiesel and conventional diesel is determined by using bomb calorimeter. In this study the amount of energy content of biodiesel produced using Potassium Hydroxide is 39738 J/g and 39096 from biodiesel produced using NaOH as catalyst. One of the most important fuel properties of biodiesel and conventional diesel fuel derived from petroleum is viscosity. Viscosity of biodiesel is higher than petroleum diesel. The biodiesel viscosity measured in this study is 16 cP for both biodiesel produced using Potassium Hydroxide and Sodium Hydroxide.