

**PRODUCTION OF BIODIESEL FROM PALM OIL BY
TRANSESTERIFICATION PROCESS BY USING POTASSIUM IODIDE
(KI) CATALYST WITH NICKEL (Ni) DOPANT AND ALUMINA (Al₂O₃)
SUPPORT**

KHAIRINA FARHANA BINTI ZUPLY

**Final Year Project Report Submitted In
Partial Fulfillment of the Requirements for the
Bachelor of Science (Hons.) Chemistry
Faculty of Applied Sciences
Universiti Teknologi Mara**

JULY 2019

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	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 of the study	1
1.2 Problem statement	3
1.3 Significant of study	4
1.4 Objective	5
CHAPTER 2 LITERATURE REVIEW	
2.1 Feedstock for biodiesel and its free fatty acid content	6
2.2 Biodiesel production by heterogeneous base-catalyzed transesterification	7
2.3 Alumina supported on potassium iodide catalyst	8
CHAPTER 3 METHODOLOGY	
3.1 Materials	10
3.2 Preparation of catalyst	10
3.3 Characterization of catalyst	11
3.4 Transesterification catalyzed with potassium iodide (KI) support alumina	11
3.5 Analysis of biodiesel produced	12
CHAPTER 4 RESULTS AND DISCUSSION	
4.1 Characterization of catalyst using Thermogravimetric analysis (TGA)	13
4.2 The effects of methanol to oil molar ratio to the biodiesel yield	16
4.3 Determination of fatty acid methyl ester (FAME) using Gas Chromatography Mass Spectrometry (GC-MS)	19
CHAPTER 5 CONCLUSION AND RECOMMENDATION	22

LIST OF TABLES

Table	Caption	Page
2.1	Feedstocks for biodiesel production	6
4.1	FAME Composition in biodiesel	21

LIST OF FIGURES

Figures	Caption	Page
4.1	TGA of KI-Al ₂ O ₃ with nickel dopant analysis	15
4.2	Percent yield of impure biodiesel	17
4.3	Percentage yield of FAME content	18
4.4	GC-MS Chromatogram of FAME yield	20

ABSTRACT

PRODUCTION OF BIODIESEL FROM PALM OIL BY TRANSESTERIFICATION PROCESS BY USING POTASSIUM IODIDE (KI) CATALYST WITH NICKEL (Ni) DOPANT AND ALUMINA (Al₂O₃) SUPPORT

In this research, biodiesel was produced by transesterification of palm oil by utilizing potassium iodide (KI) supported on alumina beads catalyst with nickel as a dopant. The objectives of this research are study the effects of nickel as dopant towards the reactions as well as to determine the most effective methanol to oil molar ratio. The reactions were refluxed at 65 °C with 4 wt.% of catalyst loading for 5 h reaction time while varying the methanol to oil molar ratio at 1:15, 1:25, 1:35, 1:45 and 1:55. The most optimum methanol to oil ratio was at 1:35 gave the yield 53.34%. The catalyst produced were characterized by using Thermogravimetric analysis (TGA). Hence the results proved that the catalyst have undergone two stages of decomposition and the calcination temperature was also can be determined using TGA which at 700 °C. The biodiesel produced then were analyzed qualitatively using Gas Chromatography Mass Spectrometry (GC-MS) using methyl heptadecanoate as the internal standard. In total there were six peaks of methyl esters appeared in the chromatogram and the details of the peaks were confirm by using MS-NIST program. The methyl esters identified was dodecanoic acid methyl ester, methyl tetradecanoate, hexadecenoic acid methyl ester, methyl stearate, octadecenoic acid methyl ester and octadecadienal acid methyl ester. In conclusion, the study has showed that among these five ratios, the most productive was 1:35 of methanol to oil molar ratio. Furthermore, nickel that act as dopant has greatly affects the catalytic reactivity of the catalyst.