

THE EFFECT OF LIGHT AND HEAT ON THE OXIDATIVE
STABILITY OF PALM OIL

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THE EFFECT OF LIGHT AND HEAT ON THE OXIDATIVE STABILITY
OF PALM OLEIN

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: The Effect of Light and Heat on The Oxidative Stability of Palm Olein oleh Lei Fei Xian, No. Matrik UK 7018 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Kimia sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains Kimia Analisis dan Persekitaran, Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

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TABLE OF CONTENTS

| | |
|------------------------------------------------------------------------|-------------|
| APPROVAL | ii |
| ACKNOWLEDGEMENT | iii |
| TABLE OF CONTENT | vii |
| LIST OF TABLES | vi |
| LIST OF FIGURES | ix |
| LIST OF PLATES | xii |
| LIST OF APPENDICES | xiii |
| LIST OF ABBREVIATIONS | xiv |
| ABSTRACT | xv |
| ABSTRAK | xvi |
| | |
| 1.0 INTRODUCTION | 1 |
| 1.1 Background of study | 1 |
| 1.2 Palm oil | 1 |
| 1.2.1 Fatty acid in vegetable oil | 4 |
| 1.3 Antioxidant | 6 |
| 1.4 Additive | 6 |
| 1.4.1 Additive Irgalube F10 | 7 |
| 1.5 Autoxidation | 8 |
| 1.6 Photochemistry | 8 |
| 1.7 Measurement of oxidation | 10 |
| 1.7.1 Acid value (AV) | 10 |
| 1.7.2 Iodine value (IV) | 10 |
| 1.7.3 Peroxide value (PV) | 12 |
| 1.7.4 Fourier transform infrared (FTIR) spectroscopy | 13 |
| 1.7.5 Thermogravimetric Analysis (TGA) | 13 |
| 1.8 Objective | 14 |
| | |
| 2.0 LITERATURE REVIEW | 15 |
| 2.1 Vegetable oils as biodegradable lubricants | 15 |
| 2.2 Oxidative stability of vegetable oil | 15 |
| 2.3 Oxidation reaction | 17 |
| 2.4 Factors that cause the lipid oxidation | 19 |
| 2.5 Effect of light on the oxidative stability | 20 |
| 2.6 Effect of antioxidant on the oxidative stability of vegetable oils | 20 |
| 2.7 Effect of additive (Irgalube F10) on the oxidative stability | 23 |
| | |
| 3.0 METHODOLOGY | 24 |
| 3.1 Chemicals | 24 |
| 3.2 Apparatus | 24 |
| 3.3 Preparation of sample | 25 |
| 3.4 Analysis of the oil under dark condition | 26 |
| 3.5 Analysis of the oil exposed to light | 27 |

| | | |
|------------|---------------------------------------------------|------------|
| 3.6 | Acid value test (AOCS method Cd 3A-63) | 28 |
| 3.7 | Peroxide value test (AOCS official method Cd8-53) | 30 |
| 3.8 | Iodine value test (AOCS method Cd 1b-87) | 32 |
| 3.9 | Fourier transform infrared (FTIR) spectroscopy | 34 |
| 3.10 | Thermogravimetric Analysis (TGA) | 34 |
| 4.0 | RESULT AND DISCUSSION | 35 |
| 4.1 | The Effect of Additive Irgalube F10 | 35 |
| 4.1.1 | Acid Value Test | 35 |
| 4.1.2 | Peroxide Value Test | 38 |
| 4.1.3 | Iodine Value Test | 43 |
| 4.1.4 | Thermogravimetric Analysis | 46 |
| 4.1.5 | Infrared Spectroscopic Analysis | 55 |
| 4.1.6 | Physical Appearance | 69 |
| 4.2 | The Effect of Light | 71 |
| 4.2.1 | Acid Value Test | 71 |
| 4.2.2 | Peroxide Value Test | 75 |
| 4.2.3 | Iodine Value Test | 79 |
| 4.2.4 | Thermogravimetric Analysis | 81 |
| 4.2.5 | Infrared Spectroscopic Analysis | 85 |
| 4.2.6 | Physical Appearance | 96 |
| 5.0 | CONCLUSION | 98 |
| 6.0 | RECOMMENDATION | 101 |
| | REFERENCES | 102 |
| | APPENDIX | 106 |
| | VITAE | 117 |

LIST OF TABLES

| TABLE | | Page |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Table 1.1: | Fatty acid in vegetable oil. | 5 |
| Table 1.2: | Fatty acid composition of palm oil | 5 |
| Table 1.3: | The deactivation mechanism of excited states. | 9 |
| Table 4.1: | Summary of total acid number (mgKOH/g) for palm olein with and without additive in the dark condition. | 36 |
| Table 4.2: | Summary of peroxide value (meq/g) with hours of palm olein with and without additive in the dark condition. | 40 |
| Table 4.3: | Summary of iodine value for palm olein with and without additive in the dark condition. | 44 |
| Table 4.4: | The results of onset temperature for palm olein with and without additive in the dark condition. | 47 |
| Table 4.5: | The results of maximum degradation temperature for palm olein with and without additive in the dark condition. | 47 |
| Table 4.6: | The results of onset temperature and maximum degradation for additive Irgalube F10. | 54 |
| Table 4.7: | Vibrational frequency and the assignment of the functional groups of palm olein before and after heating (0 & 768 hours) in the dark condition. | 58 |
| Table 4.8: | Vibrational frequency and the assignment of the functional groups of palm olein blended with additive Irgalube F10 before and after heating (0 & 768 hours) in the dark condition. | 63 |
| Table 4.9: | Summary of Total Acid Number (mg KOH/g) for palm olein with and without additive under the exposure of light. | 73 |

| | | |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Table 4.10: | Summary of Peroxide Value (meq/g) for palm olein with and without additive under the exposure of light. | 76 |
| Table 4.11: | Summary of Iodine Value for palm olein with and without additive under the exposure of light. | 79 |
| Table 4.12: | The results of onset temperature for palm olein with and without additive under exposure of light. | 82 |
| Table 4.13 | The results of maximum degradation temperature for palm olein with and without additive under exposure of light. | 82 |
| Table 4.14 | Vibrational frequency and the assignment of the functional groups of palm olein before and after exposure of light (0 & 768 hours). | 88 |
| Table 4.15 | Vibrational frequency and the assignment of the functional groups of palm olein blended with additive Irgalube F10 before and after exposure of light (0 & 768 hours). | 91 |

LIST OF FIGURES

| FIGURE | | Page |
|---------------|------------------------------------------------------------------------------------------------------------------------------|-------------|
| Figure 1.1: | The main components of Irgalube F10 | 7 |
| Figure 3.1: | Summary of acid value test (AOCS method Cd 3A-63) | 29 |
| Figure 3.2: | Summary of peroxide value test (AOCS official method Cd 8-53) | 31 |
| Figure 3.3: | Summary of iodine value test (AOCS method Cd 1b-87) | 33 |
| Figure 4.1: | Variation of Total Acid Number (TAN) with hours for Palm olein with and without additive in the dark condition. | 37 |
| Figure 4.2: | Variation of Peroxide Value (PV) with hours for palm olein with and without additive in the dark condition. | 41 |
| Figure 4.3: | General reaction pathway for the homolytic cleavage of hydroperoxides of unsaturated fats. | 42 |
| Figure 4.4: | Variation of Iodine Value (IV) with hours for palm olein with and without additive in the dark condition. | 45 |
| Figure 4.5a: | TGA thermogram of palm olein before heating at 5°C/min from ambient to 450°C. | 48 |
| Figure 4.5b: | TGA thermogram of palm olein after 768 hours of heating at 5°C/min from ambient to 450°C. | 49 |
| Figure 4.5c: | TGA thermogram of palm olein blended with additive Irgalube F10 before heating at 5°C/min from ambient to 450°C. | 50 |
| Figure 4.5d: | TGA thermogram of palm olein blended with additive Irgalube F10 after 768 hours of heating at 5°C/min from ambient to 450°C. | 51 |
| Figure 4.6: | TGA thermogram of additive Irgalube F10. | 53 |

| | | |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Figure 4.7: | Infrared spectra for palm olein (a) before heating and (b) after 768 hours of heating in the dark condition. | 56 |
| Figure 4.8: | The deduction of spectra between palm olein after 768 hours of heating with the sample before heating. | 57 |
| Figure 4.9: | Infrared spectra for palm olein blended with additive Irgalube F10 (a) before heating and (b) after 768 hours of heating in the dark condition. | 61 |
| Figure 4.10: | The deduction of spectra between palm olein blended with additive after 768 hours of heating with palm olein blended with additive before heating. | 62 |
| Figure 4.11: | The changes in the region of C=C stretching (near 1640 cm^{-1}) of the palm olein (a) before heating and (b) after heating in dark condition. | 65 |
| Figure 4.12: | The changes in the region of C=C stretching (near 1640 cm^{-1}) of the palm olein blended with additive Irgalube F10 (a) before heating and (b) after heating in dark condition. | 67 |
| Figure 4.13: | Chemical reaction of the formation of fatty acids from the rearrangements of the glyceride ester. | 68 |
| Figure 4.14: | Variation of Total Acid Number (TAN) with hours of light exposure for palm olein with and without additive. | 74 |
| Figure 4.15: | Variation of Peroxide Value (PV) with hours of light exposure for palm olein with and without additive. | 77 |
| Figure 4.16: | Proposed chemical reaction of the formation of hydroperoxides by the photo-oxidation. | 78 |
| Figure 4.17: | Variation of Iodine Value (IV) with hours of light exposure for palm olein with and without additive. | 80 |
| Figure 4.18a: | TGA thermogram of palm olein after 768 hours of light exposure at 5°C/min from ambient to 450°C. | 83 |

| | | |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Figure 4.18b: | TGA thermogram of palm olein blended with additive Irgalube F10 after 768 hours of light exposure at 5 ⁰ C/min from ambient to 450°C. | 84 |
| Figure 4.19: | Infrared spectra for palm olein (a) before light exposure and (b) after 768 hours of light exposure. | 86 |
| Figure 4.20: | The deduction of spectra between palm olein after 768 hours of light exposure with oil sample before light exposure. | 87 |
| Figure 4.21: | Infrared spectra for palm olein blended with additive Irgalube F10 (a) before light exposure and (b) after 768 hours of light exposure. | 89 |
| Figure 4.22: | The deduction of spectra between palm olein blended with additive Irgalube F10 after 768 hours of light exposure with oil sample before light exposure. | 90 |
| Figure 4.23: | The changes in the region of C=C stretching (near 1640 cm ⁻¹) of the palm olein (a) before light exposure and (b) after exposure of light. | 93 |
| Figure 4.24: | The changes in the region of C=C stretching (near 1640 cm ⁻¹) of the palm olein blended with additive Irgalube F10 (a) before light exposure and (b) after exposure of light. | 94 |
| Figure 4.25: | The formation of fatty acid from the breakdown of Ca. | 95 |

LIST OF PLATES

| PLATE | | Page |
|--------------|------------------------------------------------------------------------------------------------------------------------------|-------------|
| Plate 4.1: | The colour changes of sample palm oil heated at temperature 135°C in the dark condition. | 70 |
| Plate 4.2: | The colour changes of sample palm olein blended with additive Irgalube F10 heated at temperature 135°C in the dark condition | 70 |
| Plate 4.3: | The colour changes of palm olein under the exposure of light. | 97 |
| Plate 4.4: | The colour changes of palm olein blended with additive Irgalube F10 under the exposure of light. | 97 |

LIST OF APPENDICES

| APPENDIX | | Page |
|-----------------|------------------------|-------------|
| Appendix A: | Data Acidity Test | 106 |
| Appendix B: | Data Iodine Value Test | 110 |
| Appendix C: | Data peroxide value. | 112 |

LIST OF ABBREVIATIONS

Abbreviation

| | | |
|-----------------------------------------------|---|-----------------------------------|
| AOCS | = | American Oil Chemists' Society |
| AV | = | Acid Value |
| PV | = | Peroxide Value |
| IV | = | Iodine Value |
| FTIR | = | Fourier Transform Infrared |
| DSC | = | Differential scanning Calorimetry |
| FA | = | Fatty Acid |
| FAA | = | Free Fatty Acid |
| KOH | = | Potassium Hydroxide |
| KI | = | Potassium Iodide |
| TAG | = | Triacylglycerols |
| Na ₂ S ₂ O ₃ | = | Sodium Tiosulfate |
| TAN | = | Total Acid Number |
| <i>p</i> -AV | = | <i>p</i> -anisidine Value |
| TGA | = | Thermogravimetric Analysis |

ABSTRACT

Palm oil has the potential for use as a vegetable-based lubricant for hydraulic system. The focus of this study is to determine the effect of light and heat on oxidative stability of palm olein. Samples were prepared under two different conditions which were stored in darkness and under visible light. Besides that, the effects of additive Irgalube F10 under the different conditions were determined. The oil samples were stored at two different temperatures which are room temperature and 135°C (heated in oil bath) for 768 hours. The oil samples at selected hours were analyzed with acid value test (AV), peroxide value test (PV), iodine value test (IV). Fourier transform infrared (FTIR) spectroscopy was used to confirm the micro structural changes of palm olein while thermogravimetric analysis (TGA) was used to detect any changes in bulk properties of palm olein. The results from this study shows that the oxidation of palm olein was affected by the heating process and the exposure of light where encourage the oxidation of palm olein. The result also shown that additive Irgalube F10 acts as photosensitizer under the exposure of light where the acid value is higher. Therefore, the additive Irgalube F10 under the exposure of light only manages to prevent the formation of hydroperoxides but increases the formation of fatty acid. Overall, additive Irgalube F10 can reduce the oxidation of palm olein

ABSTRAK

Minyak kelapa sawit berpotensi untuk digunakan sebagai pelincir dalam sistem hidraulik. Kajian ini akan menumpu kepada kesan cahaya dan pemanasan terhadap kestabilan oksidasi bagi minyak sawit olein. Sampel disediakan dalam dua keadaan yang berlainan iaitu akan disimpan dalam keadaan gelap dan juga dipancarkan dengan cahaya. Di samping itu, kesan aditif akan diuji. Sampel minyak disimpan dalam suhu yang berlainan, iaitu suhu bilik dan 135°C (dipanaskan dalam rendaman minyak) selama 768 jam. Sampel minyak pada masa yang tertentu akan dianalisa dengan menggunakan ujian keasidan (AV), ujian peroksida (PV), dan ujian iodin (IV). Spektroskopi inframerah (FTIR) digunakan untuk menentukan perubahan mikro struktur dalam minyak sawit olein. Manakala analisis termogravimetri digunakan untuk menentukan perubahan sifat-sifat pual dalam minyak sawit olein. Kajian menunjukkan bahawa pengoksidaan minyak sawit olein dipengaruhi oleh pemanasan dan juga pemancaran cahaya dimana pendedahan minyak sawit olein terhadap suhu yang tinggi dan pancaran cahaya menyebabkan peningkatan kadar pengoksidaan. Keputusan juga menunjukkan fungsi aditif Irgalube F10 berfungsi sebagai fotosensitiser di bawah pancaran cahaya. Ini dapat ditunjukkan dengan peningkatan nilai dalam ujian keasidan. Oleh demikian, aditif Irgalube F10 hanya dapat menahan pembentukan hidrogenperoksida tetapi telah meningkatkan pembentukan asid lemak. Secara keseluruhan, aditif Irgalube F10 berkesan untuk mengurangkan proses pengoksidaan.