[redacted]

The effect of light and heat on the oxidative stability of palm olein.

Lihat sebelah

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

By
Lei Fei Xian

Research Report submitted in partial fulfillment of
the requirement for the degree of
Bachelor of Science (Analytical Chemistry and Environmental)

Department of Chemical Sciences
Faculty of Science and Technology
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2005

KUSTEM

JABATAN SAINS KIMIA
FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA

PENGAKUAN DAN PENGESAHAN LAPORAN PROJEK PENYELIDIKAN I DAN II

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.

Disahkan oleh:

.....

Penyelia Utama

Nama: Prof. Madya Dr. Ku Halim Ku Bulat

Cop Rasmi: PROF. MADYA DR. KU HALIM KU BULAT
Ketua
Jabatan Sains Kimia
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.
Tel: 09-6683257

Tarikh: 13th April 2005

.....

Penyelia Kedua

Nama: Dr. Wan Norsani Wan Nik

Cop Rasmi: WAN MOHD NORSANI WAN NIK
Pensyarah Kejuruteraan Mekanikal
Jabatan Matematik dan Sains Kejuruteraan
Fakulti Sains dan Teknologi
Kolej Universiti Terengganu
21030 Kuala Terengganu.

Tarikh: 13/4/05

.....

Ketua Jabatan Sains Kimia

Nama: Prof. Madya Dr. Ku Halim Ku Bulat

Cop Rasmi: PROF. MADYA DR. KU HALIM KU BULAT
Ketua
Jabatan Sains Kimia
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
21030 Kuala Terengganu.
Tel: 09-6683257

Tarikh: 13th April 2005

ACKNOWLEDGEMENT

First of all, I would like to express my deepest gratitude to my supervisor, Prof. Madya Dr. Ku Halim Ku Bulat for his supports, guidance, valuable advices and supervisions that help me a lot to complete the work successfully. Without his guidance, I would not be able to learn so much knowledge from the final project.

Secondly, I am also grateful to co-supervisor, Dr. Wan Sani Wan Nik, for his guidance and suggestions throughout the progress of this final project. Thank you very much for giving me a chance to learn so many things in the project.

I would also want to thank all the assistants of chemistry lab because of their kind helps and guidance during lab analysis.

To my family who always by my side that giving me supports and love, I would like to thank them heartily. Besides that, I would like to thank Yong Yoon Fei for his help, care and encouragement. Thank you very much.

My heartiest gratitude and big thank you goes to all my friends who bear with me through these few months especially Ong Yik Sheng.

Lastly, I am grateful to Faculty of Science and Technology of KUSTEM for their generous financial support for this project. A special thank you once again to all of named above and those who are not mentioned for helping me in completing this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

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
$Na_2S_2O_3$	=	Sodium Tiosulfate
TAN	=	Total Acid Number
p-AV	=	*p*-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 pukal 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.