

MODIFICATION OF TERT-BUTYLHYDROQUINONE WITH PALMITIC ACID  
AS A SOLUBLE ANTIOXIDANT FOR BIODIESEL ADDITIVE

By

Amanda Jehan Pramastiani  
11404017

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SWISS GERMAN UNIVERSITY  
The Prominence Tower  
Jalan Jalur Sutera Barat No. 15, Alam Sutera  
Tangerang, Banten 15143 - Indonesia

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### STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Amanda Jehan Pramastiani

Student

Date

Approved by:

Hery Sutanto, S.Si, M.Si.

Thesis Advisor

Date

Dr. Akhmad Darmawan, M.Si.

Thesis Co-Advisor

Date

Dr. Dipl.-Ing. Samuel P. Kusumocahyo

Dean

Date

Amanda Jehan Pramastiani

## ABSTRACT

### MODIFICATION OF TERT-BUTYLHYDROQUINONE WITH PALMITIC ACID AS A SOLUBLE ANTIOXIDANT FOR BIODIESEL ADDITIVE

By

Amanda Jehan Pramastiani

Hery Sutanto, S.Si, M.Si., Advisor

Dr. Akhmad Darmawan, M.Si., Co-Advisor

SWISS GERMAN UNIVERSITY

Biodiesel is a product resulted from the process of transesterification of vegetable oil or animal fat. Biodiesel is a renewable fuel and uses as alternative to fossil fuel diesel. However, one of the biodiesel drawbacks which is oxidation can affect the storage stability of the biodiesel. One way to solve this problem is by using antioxidant additives to improve the storage stability of biodiesel. Tert-Butylhydroquinone is a common synthetic phenolic antioxidant and has a proven superior antioxidant activity due to its polar characteristic. The difference in polarity between non-polar biodiesel and phenolic antioxidant makes their solubility becomes very low. In this study, modification of tert-Butylhydroquinone with palmitic acid was done by using Friedel-Crafts acylation to increase its solubility in biodiesel. The resulting proposed product 1-(2-(tert-butyl)-3,6-dihydroxyphenyl)hexadecane-1-one, was confirmed using TLC, LC-MS/MS and characterized by using  $^1\text{H-NMR}$ . The product showed solubility limit at concentration 2500 ppm and antioxidant activity with the  $\text{IC}_{50}$  value of 675.38 ppm, which both results are lower compared to tert-Butylhydroquinone.

*Keywords: Biodiesel, Tert-Butylhydroquinone, Antioxidant, Friedel-Crafts Acylation Solubility*



## DEDICATION

I would like to dedicate this thesis work to Allah S.W.T and my family.



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