

**SYNTHESIS OF SORBITOL FATTY ACID ESTER THROUGH
ESTERIFICATION OF SORBITOL WITH AZELAIC ACID
CATALYSED BY GERMANIUM (IV) OXIDE**

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**BACHELOR OF CHEMICAL ENGINEERING
UNIVERSITI MALAYSIA PAHANG**

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Thesis is submitted in partial fulfilment of the requirements
for the award of the degree of
Bachelor of Chemical Engineering

**Faculty of Chemical & Natural Resources Engineering
UNIVERSITI MALAYSIA PAHANG**

JUNE 2017

SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Chemical Engineering.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree

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Dedicated to my parents and my siblings.

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LIST OF ABBREVIATIONS

AA	Azelaic acid
AD	Adipic acid
AV	Acid value
BHET	Bis-hydroxyethyl terephthalate
CAGR	Compounded annual growth rate
DEG	Diethylene glycol
DTE	DL-dithiothreitol
DMT	Dimethyl terephthalate
EG	Ethylene glycol
GC	Gas chromatography
HMDS	Hexamethyldisilazane
HDI	Hexamethylene diisocyanate
IPDI	Isophrone diisocyanate
KHP	Potassium hydrogen phthalate
KOH	Potassium hydroxide
PET	Polyethylene terephthalate
PU	Polyurethane
PCL	Poly(ϵ -caprolactone)
PGS	Poly(glycerol sebacate)
PPS	Poly(poly sebacate)
SB	Sorbitol
SFAE	Sorbitol fatty acid ester
TMCS	Trimethylchlorosilane
TPA	Terephthalic acid
TPUs	Thermoplastic polyurethanes
X	Conversion
1,4-CHDA	1,4- cyclohexanedicarboxylic
1,4- CHDM	1,4-cyclohexanedimethanol
HDO	1,6-hexanediol