

**USE OF HYDROLYSIS PRODUCTS OF  
POLYETHYLENE TEREPHTHALATE SCRAPS  
TO PRODUCE ALKYD BASED PAINT**

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Department of Materials Science and Engineering

University of Moratuwa

Sri Lanka

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Thesis submitted in partial fulfillment of the requirements for the degree Master of  
Philosophy in Materials Science & Engineering

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## ABSTRACT

In modern world, plastics play a significant role in our daily life. However Sri Lankans' still have not introduced proper waste management system to daily increasing plastic garbage.

Polyethylene terephthalate (PET) is one of the main plastic used in day today life as packaging material, soft drink and mineral water bottles. Sri Lankan peoples alone consumes 6.5 million PET bottles per month but only 1.5 million bottles collected for recycling. This gives clear indication about the role of PET in environmental pollution.

This report present development of effective chemical recycling process to de-polymerize PET waste into its initial monomers and use of de-polymerized products to synthesized alkyd resin which can be use in coating industry.

Depolymerization of PET was done by hydrolysis method to extract terephthalic acid(TPA) . Here  $\text{Na}_2\text{CO}_3$  was successfully used as hydrolysis agent instead of highly corrosive  $\text{NaOH}$  . This overcome the common disadvantages of  $\text{NaOH}$  .

At 170 °C, 35 minutes and 1:4 PET: EG (ethylene glycol) mole ratio 78.89% PET was reacted with  $\text{Na}_2\text{CO}_3$  without any catalyst.

Recovered terephthalic acid was used to replace Phthalic anhydride in alkyd resin. Due to the inability of conventional alcoholysis method to making alkyd resin from TPA, a new methodology was developed. New Process was successfully incorporated to produce long oil alkyd resin with soya oil, glycerin, maleic anhydride and recovered TPA. Under this new method alkyd processing time was greatly reduced and minimum time achieved was 120 minutes at 280 °C.

Practical application of this project to the local PET waste will help to reduce the plastic land fill in Sri Lanka and also provide more beneficial effects to the alkyd paint industry by reducing production time and raw material cost.

# CONTENTS

Declaration .....	i
Acknowledgement.....	ii
Abstract .....	iii
List of Tables.....	vi
List of Figures .....	vii
List of Abbreviation .....	viii
1. Introduction .....	1
2. Literature Survey.....	3
2.1 Polyethylene Terephthalate.....	3
2.1.1 History of PET .....	3
2.1.2 Properties of PET .....	3
2.1.3 Production of PET.....	4
2.1.4 Identification of PET items .....	4
2.1.5 Polyethylene Terephthalate Recycling.....	5
2.2 Terephthalic acid (TPA).....	8
2.2.1 History of TPA.....	9
2.2.2 Production of TPA .....	9
2.2.3 Properties of terephthalic acid.....	10
2.2.4 Identification of TPA .....	10
2.3 Paints .....	11
2.3.1 Resins (binders).....	11
2.3.2 Alkyds in paints .....	12
2.3.3 Acids used in alkyd resins.....	12
2.3.4 TPA in Alkyd Paints.....	14
2.3.5 Polyols.....	14
2.3.6 Oil Length and Type of Oils.....	14
Source : Solomon, D.H., “The Chemistry of Organic Film Formers”.....	16
2.3.7 Fatty Acids .....	17
2.4 Alkyd Preparation Methods. ....	17
2.4.1 The fatty acid process.....	17
2.4.2 Monoglyceride/ Alcoholysis Process.....	17
2.4.3 Fusion cook method .....	18
2.4.4 Solvent cook method.....	18
2.5 Water-Borne Alkyds .....	19
2.6 Summary on Past Researches .....	19
3. Materials and Methodology .....	21
3.1. Materials.....	21
3.2 Materials Used for Hydrolysis of PET.....	21
3.3 Materials Used for Synthesis of Alkyd Resin .....	22
3.4 Methodology .....	24
3.4.1 Hydrolysis of PET.....	24
3.4.2 Synthesis of Alkyd Resin.....	27
Formation of monoglyceride.....	27
Esterification .....	28
Development of new methodology .....	29
3.6 Testing Procedures .....	30

3.6.1 Determination of acid value .....	30
3.6.2 Determination of hydroxyl value .....	30
3.6.3 Saponification number .....	31
3.6.4 Adhesion Test .....	32
3.6.5 Determination of Touch Drying Time .....	32
3.6.6. Bending Test .....	32
4. Results and Discussion.....	33
4.1 Hydrolysis of PET.....	33
4.2 Synthesize of alkyd resin using extracted TPA.....	40
5. Conclusions .....	61
References .....	62
Publications .....	65



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## LIST OF TABLES

Table 2-1: Properties of PET .....	3
Table 2-2: Consumption of synthetic resins in Paints and coatings 1999.....	12
Table 2-3: Common polybasic acids & alcohols used in Alkyd resins .....	13
Table 2-4: Effect of Oil Length and Type of Oil on the Properties of Alkyds .....	16
Table 2-5: Catalyst use in Alcoholysis Process .....	18
Table 3-1: Conditions used for Hydrolysis of PET.....	25
Table 3-2: Reference Alkyd Recipe .....	27
Table 3-3: Different Compositions used for Synthesis of Alkyd Resins .....	28
Table 4-1: Hydrolysis conditions of PET with aqueous NaOH (2.08 M).....	33
Table 4-2: Hydrolysis conditions of PET with aqueous NaOH (3.4 M).....	34
Table 4-3: Hydrolysis conditions of PET with 3.4 M aqueous NaOH .....	35
Table 4-4: Reacted PET percentages with Na <sub>2</sub> CO <sub>3</sub> at different conditions.....	38
Table 4-5: Percentage conversion of PET with Na <sub>2</sub> CO <sub>3</sub> when PET: EG = 1:4 .....	39
Table 4-6: Tested properties of Oil .....	40
Table 4-7: Reference alkyd formula .....	41
Table 4-8: Time taken to form monoglyceride with different catalysts.....	42
Table 4-9: Tested Properties for Reference Resin .....	43
Table 4-10: Alkyd recipe 1 (R1) .....	44
Table 4-11: Tested Properties of R1 .....	45
Table 4-12: Alkyd Recipe 2 .....	46
Table 4-13: Alkyd Recipe 3 .....	47
Table 4-14: Summary Results for alkyd synthesis at 240 (±5)°C.....	48
Table 4-15: Amount of water emitted by all recipes at 240 °C.....	48
Table 4-16: Summary results for alkyd synthesis at 250 (±5)°C .....	49
Table 4-17: Summary Results for alkyd synthesis at 260 (±5)°C .....	49
Table 4-18: Alkyd Recipe 4 .....	50
Table 4-19: Alkyd Recipe 5 .....	51
Table 4-20: Tested Properties of R5 at different temperatures.....	54
Table 4-21: Oil length of the Resins Produced by R5 .....	55
Table 4-22: Alkyd Recipe 6 .....	55
Table 4-23: Tested Properties of R6 at different temperatures.....	57
Table 4-24: Tested Properties of R7 at different temperatures.....	57



## LIST OF FIGURES

Figure 2-1: Chemical structure of polyethylene terephthalate.....	3
Figure 2-2 :Preparation of polyethylene terephthalate.....	4
Figure 2-3:Identification systems for PET containers .....	5
Figure 2-4: Structure of BHET .....	6
Figure 2-5:Chemical de-polymerization of post-consumer PET by methanol .....	7
Figure 2-6:Reaction of PET with of high temperature high pressure water. ....	8
Figure 2-7: Atomic Structure of Terephthalic acid. ....	8
Figure 2-8:Production of TPA .....	9
Figure 2-9: FTIR spectrum of Terephthalic acid .....	10
Figure 4-1: Time vs Reacted PET percentage graph for PET: EG 1:1 .....	36
Figure 4-2: Time vs Reacted PET percentage graph for PET: EG 1:2 .....	36
Figure 4-3: Comparison of FTIR spectrums of Extracted and Reference TPA .....	37
Figure 4-4: Percentage conversion of PET with Na <sub>2</sub> CO <sub>3</sub> when PET:EG = 1:2 .....	38
Figure 4-5: Comparison of FTIR spectrums of MEG.....	39
Figure 5-6 : FTIR spectrum of the Extracted TPA by using Na <sub>2</sub> CO <sub>3</sub> .....	40
Figure 4-7: Time vs acid value variation graph for Reference Recipe .....	43
Figure 4-8 : Time vs Acid value variation graph for R1 .....	45
Figure 4-9: Time vs Acid value variation graph for R2.....	46
Figure 4-10: Time vs Acid value variation graph for R3.....	47
Figure 4-11: Time vs Variation of AV for R5 at 260 °C .....	51
Figure 4-12: Time vs Variation of AV for R5 at 250 °C .....	52
Figure 4-13: Time vs Variation of AV for R5 at 270 °C.....	52
Figure 4-14: Variation of Acid Value of R6 with Time at Different Temperatures..	56
Figure 4-15: FTIR spectrum of Soya bean oil and Alkyd Resin .....	59



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## LIST OF ABBREVIATION

PET	Polyethylene Terephthalate
TPA	Terephthalic Acid
PA	Phthalic Anhydride
MA	Maleic Anhydride
EG/MEG	Mono Ethylene Glycol
FTIR	Fourier Transform Infrared Spectroscopy
PE	pentaerythritol

### Alkyd Calculation

M	Molecular Weight
m	Number of moles
$m_0$	Total moles present at start of reaction
$e_0$	Total equivalent present at start of reaction
$e_a$	Number of acid equivalent
$e_b$	Number of hydroxyl equivalent
F	Functionality
P	Percentage completion of reaction
AN/AV	Acid Value/Acid Number
HN	Hydroxyl number
W	Weight



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