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

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Degree of Master of Philosophy

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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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DECLARATION

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ACKNOWLEDGEMENT

First and foremost, I would like to express my profound gratitude and deep regards to my Initial Supervisor late Dr.P.Y.Gunapala for providing me the opportunity with guidance and encouragement to work on this project. I also give my deepest gratitude and deep regards to my supervisor, Dr. (Mrs.) Olga Gunapala for her exemplary guidance, monitoring and constant encouragement throughout the research project.

I am obliged to Head and the staff members of Department of Materials Science & Engineering and Department of Chemical & Process engineering, University of Moratuwa for the valuable information provided by them in their respective fields. I am grateful for their cooperation during the period of research.

I also express a deep sense of gratitude to laboratory staff of both departments for their support, and guidance, which helped me in completing this research project through various stages.

Lastly, I thank almighty, my parents, wife and friends for their constant encouragement without which this assignment would not be possible.

S.V.Udayakumara

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 Na_2CO_3 was successfully used as hydrolysis agent instead of highly corrosive NaOH . This overcome the common disadvantages of NaOH .

At 170 °C, 35 minutes and 1:4 PET: EG (ethylene glycol) mole ratio 78.89% PET was reacted with Na_2CO_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.

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LIST OF ABBREVIATION

PET	Polyethlene Terephthalate
TPA	Terephthalic Acid
PA	Phthalic Anhyried
MA	Maleic Anhydried
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