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APPLICATION OF POLYETHYLENE TEREPHTHALATE SCRAPS FOR THE MANUFACTURING LONG OIL ALKYD RESIN

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Thesis submitted in partial fulfillment of the requirement for the

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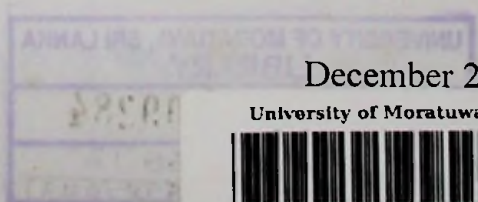
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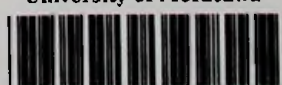
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ABSTRACT

A new aspect of work that covers Polyethylene terephthalate (PET) waste recycling and application in coating industry is presented through this report. It was shown that chemical recycled PET can be used in the manufacturing long oil alkyd resin. In Sri Lanka alone, about 6.5 million polyethylene terephthalate bottles (water bottles, food and other liquid containers, etc) are used monthly. Then large amount of Polyethylene terephthalate scraps are discharged in to the environment. The development of effective recycling technology was based on chemical de-polymerization of post-consumer PET bottles in order to use manufacturing alkyd resin based paint. The depolymerization of PET can be carried out in many ways such as glycolysis, hydrolysis, aminolysis, methanolysis and simultaneous hydrolysis and glycolysis. The useful material terephthalic salt can be synthesis through the hydrolysis process of PET. That could be used to derive terephthalic acid. This terephthalic acid can be used for alkyd resin process. Alkyd resins were any of a large group of thermoplastic resins that were essentially polyester made by heating polyhydric alcohol with polybasic acids or their anhydride and used chiefly in making protective coatings. Originally, alkyd resins were merely the reaction products of phthalic anhydride and glycerine. But these products were too brittle to make satisfactory coatings. The use of oils or unsaturated fatty acids in combination with the brittle alkyds resulted in the air-drying coatings which revolutionized the chemical coating industry. The properties of Terephthalic acid have far same to the phthalic acid. Phthalic anhydride was used as a main material in esterification reaction of alkyd resin process. Then phthalic anhydride could be replaced by Terephthalic acid. This process has been done in two stages. At the first stage, reaction between PET waste and sodium hydroxide were used to produce terephthalic acid. At the second stage, application of terephthalic acid was done in the manufacturing process of long oil alkyd resin. That could be used in industrially. Terephthalic salt could be produced successfully by hydrolysis process using Ethylglycol and sodium hydroxide at the higher temperature (180°C). The reacting mixture was neutralized using strong Acid to take Terephthalic acid. Then terephthalic acid could be applied in alkyd resin process without filtering. This new application of the recycled PET in synthesis of alkyd resin had provided same properties of normal alkyd resins. This method was cost saving method by reducing Rs. 3.00 per one kilogram of resin. As well as this can be used as environmental friendly method to give a better solution for the environment pollution due to plastic waste.

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PET	polyethylene terephthalate
IPA	isopropyl alcohol
MA	maleic anhydride
MDI	methylenediphenyl diisocyanate
MDI-60	hexamethylene diisocyanate
MDI-100	toluene diisocyanate
MDI-200	4,4'-methylenebis(phenyl isocyanate)
MDI-300	4,4'-methylenediphenyl diisocyanate
MDI-400	4,4'-methylenediphenyl diisocyanate
MDI-500	4,4'-methylenediphenyl diisocyanate
MDI-600	4,4'-methylenediphenyl diisocyanate
MDI-700	4,4'-methylenediphenyl diisocyanate
MDI-800	4,4'-methylenediphenyl diisocyanate
MDI-900	4,4'-methylenediphenyl diisocyanate
MDI-1000	4,4'-methylenediphenyl diisocyanate
MDI-1100	4,4'-methylenediphenyl diisocyanate
MDI-1200	4,4'-methylenediphenyl diisocyanate
MDI-1300	4,4'-methylenediphenyl diisocyanate
MDI-1400	4,4'-methylenediphenyl diisocyanate
MDI-1500	4,4'-methylenediphenyl diisocyanate
MDI-1600	4,4'-methylenediphenyl diisocyanate
MDI-1700	4,4'-methylenediphenyl diisocyanate
MDI-1800	4,4'-methylenediphenyl diisocyanate
MDI-1900	4,4'-methylenediphenyl diisocyanate
MDI-2000	4,4'-methylenediphenyl diisocyanate

LIST OF ABBREVIATIONS

Abbreviation	Description
PET	Polyethylene terephthalate
TPA	Terephthalic acid
EG	Ethylene glycol
BHET	Bis(2-hydroxyethyl) terephthalate
SCFA	Short-chain fatty acids
MCFA	Medium-chain fatty acids
LCFA	Long-chain fatty acids
VLCFA	Very-Long-chain fatty acids
DCPD	Dicyclopentadiene
PETE/PETP or PET-P	PET
DMT	Dimethyl terephthalate
BHETA	Bis(2-hydroxy ethylene) terephthalamide
LAWS	Law aromatic white spirit
TPP	Triphenyle phosphate