

**Synthesis of Novel Resin from Post Consumer PET Waste
and Methyl Ricinoleate for Two Pack Surface Coating**

By

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for the Award of the Master of Science in
Polymer Science and Technology**

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DECLARATION

The work described in this thesis was carried out by me under the supervision of Dr.M.A.B. Prashantha, Senior lecturer, Department of Chemistry, University of Sri Jayewardenepura and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree/Diploma.



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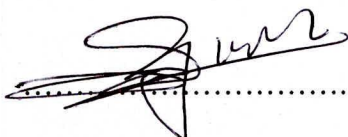
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CERTIFICATION

I certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.



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LIST OF ABBREVIATIONS

PET / PETE	Polyethylene terephthalate
LDPE / PELD	Low density polyethylene
LLDP / LLD	Linear low density polyethylene
HDPE / PEHD	High density polyethylene
PVC	Poly vinyl chloride
PP	Polypropylene
PS	Polystyrene
PA	Polyamide
PBT	Polybutylene terephthalate
PPS	Polyphenylene sulfide
PPO	Polyphenylene oxide
PSU	Polysulphone
ABS	Acrylonitrile butadiene styrene
SPI	Society of plastic industries
PUR	Polyurethane
PMMA	Poly (methyl methacrylate)
MSW	Municipal solid waste
EG	Ethylene glycol
HDI	Hexamethylene Diisocyanate
TDI	Toluene Diisocyanate
MDI	Diphenylmethane 4, 4' Diisocyanate
IPDI	Isophorone Diisocyanate
BHET	Bis (2-hydroxyethyl) terephthalate

ASTM	American society of testing and materials
FTIR	Fourier transformed infra-red
DSC	Differential scanning calorimetry
MA	Maleic anhydride
TPA	Terephthalic acid
DMT	Dimethyl terephthalat
TPR	Thermoplastic polyester resin
AARG	Annual average rate growth
NaOH	Sodium hydroxide
KOH	Potassium hydroxide
CO ₂	Carbon dioxide
g	Gram
h	Hour
kg m ⁻³	Kilograms per cubic meter
mol dm ⁻³	Moles per cubic decimeter
ml	Milliliter
rpm	Rounds per minute
g / mol	Gram per mole
g / ml	Gram per milliliter
k/Pa	Kilo pascal
KJ / mol	Kilojoule per mole
J / (kg.K)	Joule per kilogram Kelvin
mPa.s	Millipascal second

mt

Million tonnes / Metric tonnes

°C

Centigrade

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ABSTRACT

The problem of plastic waste is now a global one and waste PET represents one of the most successful examples of polymer plastic recycling. The intermediate product was BHET, which obtained from the glycolysis process and highest yield of BHET, 66 % was obtained at temperature 198 °C after 90 minutes reflux in the presence of zinc catalyst while stirring continued at 100 r.p.m speed. The castor oil was extracted by solvent extraction and percentage oil content of castor seeds was found to be 31.34 % of the total weight of 210 g. The castor oil was transesterified into methyl ricinoleate by methanol with sodium methoxide as catalyst. The BHET was readily polyesterified with maleic anhydride and methyl ricinoleate to obtain the polyester resin in the absence of acid catalyst. The reaction vessel was heated at temperature 135°C for 150 minutes while continues stirring. At 135°C, the kinetics plots were demonstrated that the first order reaction due to linearity. Polyester resins were formulated as two pack coating application which reacted with HDI as cross linking agent. The mixed compositions were coated on different surfaces such as glass, rubber, plastic, metal and wood and performance of the film has been evaluated accordingly.