

**An Investigation Of Reuse The
Photopolymer Printing Plate
Developing Solvent & Waste
Photopolymer As An Adhesive.**

BSc

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This thesis was submitted in partial fulfillment of the requirements for the Master of Science in Polymer Science and Technology to the Faculty of Graduate Studies of the University of Sri Jayewardenepura, Sri Lanka.

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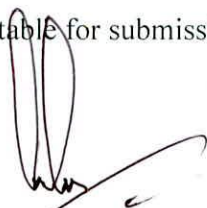
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List of abbreviation

Abum	-	Abundance level
Abs	-	Absorbance
Act	-	Actual temperature
ASTM	-	American Standard Testing Manual
AR	-	Analytical Reagent
bp	-	Boiling Point
CH ₂ Cl ₂	-	Dichloromethane
EtOAc	-	Ethyl acetate
FDA	-	Food and Drug Administration
f.p.	-	Flash point
FT-IR	-	Furrier Transfer-Infra Red
GC	-	Gas Chromatography
GC-IR	-	Gas Chromatography- Infra Red
GC/MS	-	Gas Chromatography/Mass spectroscopy
HPLC	-	High performance Liquid Chromatography
Hz	-	Hertz
IR	-	Infra Red
ISO	-	International Standard Organization
LDPE	-	Low Density polyethylene
LLDPE	-	Linear Low Density polyethylene
MeOH	-	Methanol
m.w.	-	Molecular weight
Mp	-	Melting Point
MW	-	Molecular weight
MG	-	Methyl Grafted Natural Rubber
MHz	-	Mega Hertz
NMR	-	Nuclear magnetic Resonance
PE	-	Polyethylene

PET	-	polyethylene Threphthalate
ppm	-	Parts per million
RH	-	Relative Humidity
rpm	-	Revolution per minute
Set	-	Set Temperature
TLC	-	Thin Layer Chromatography
TMPTA	-	Tri-methyl propane tri-acrylate
UV	-	Ultra Violet
λ_{\max}	-	Maximum wave Length
V_{\max}	-	Maximum Frequency

Abstract

Photopolymers are imaging materials, composition is based on polymer, which can be selectively polymerized and/ or cross-linked upon image vice exposed light radiation such as ultra-violet light. These image mainly used in printing industry in colours vice printing and the varnishing. The Plate material is exposed to an ultraviolet light through a high contrast negative. The UV cross-links the polymers and develops the image. The unexposed portion of the negative is washed off with solvent, dried and post exposed.

These Photopolymer plate and solvent are waste in printing industry after processing and usage. Both these materials are not reused in the industry today. I investigated the possibility of reuse of the plate washed solvent and waste photopolymer for another application.

The exposed and unexposed photopolymer materials were identified using FTIR analysis. They consist of 2-chloro-1, 3-butadiene, Tri-methyl propane tri-acrylate (TMPTA) prepolymer and photo initiator. These prepolymeric materials become harder after UV cross-linking.

One objective of this project is the recovery of solvent used to develop the photopolymer. The distillation was done at 180°C and its efficiency was increased by applying vacuum.

The other objective is the reuse of the waste exposed and unexposed photopolymer plates. They were used in a preparation of an adhesive after mitigation with neoprene rubber MgO, and ZnO and dissolved in toluene/MEK solvent system. Adhesive properties were compared with commercial available adhesives. Unexposed photopolymer materials found to show better properties. The composition of adhesive can be adjusted to improve the properties of adhesive. The adhesive developed can be used to paste various plastic and paper materials.