

**Research on Technology Development for Reclamation
of Waste Tire Rubber**

By

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This thesis was submitted in partial fulfillment of the requirement for the Master Degree of
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The work described in this thesis was carried out by me under the supervision of Dr. Laleen Karunanayaka and a report on this has not been submitted in whole or in part to any university or any other institution for another degree.


.....
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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



.....
Dr.Laleen Karunanayaka

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ABSTRACT

The disposal of waste rubber is a serious environmental problem and the automotive wastes contribute major portion for waste rubber. The reuse and reclaiming are the potential solution for waste tire problem.

Several grinding process are used for converting of shredded tire pieces to ground tire crumb and ground tire crumb is a main component in the reclaimed rubber. The chemical, ultrasonic, microwave and biological reclaiming process have been developed and some processes are commercially operated with using ground tire rubber.

The aim of this study was to develop chemical reclaiming process for ground tire crumb to achieve optimum processing and physical properties with maintaining low cost, low processing temperature and minimum machinery involvement.

In this study ground tire rubber was mixed with various proportion of chemical reclaiming agent and paraffinic rubber process oil then preheated to specified temperature for specified time period. Then sample was subjected to a mechanical shear process. The further improvement was carried out by partial replacement of paraffinic oil by natural oil and introducing physical peptizers and divalent metal stearates.

The processing properties of each step was measured by Mooney viscometer and physical properties such as Hardness, Resilience, Abrasion, Tensile strength, Modulus, Elongation at break and Cut resistance were measured. The selected trials were carried out in pilot scale.

From this study it appears that the low dosage of reclaiming agent together with blend of paraffin oil and natural oil behave as effective reagent for reclaiming process and the addition of Zinc soaps of fatty acids, divalent metal stearates enhance the process further.

ABBREVIATIONS

ASTM	American Society for testing and materials
BR	Butadiene Rubber
CBS	N- cyclohexyl 2- benzothiazolesulfenamide
Contd.	Continuation
DIN	Deutsches Institute for Norming
DPG	Diphenyl guanidine
EV	Efficient Vulcanization
GTC	Ground Tire Crumb
IIR	Butyl Rubber
IPPD	N –Isopropyl –N’-phenyl-p-phenylenediamine
ISO	International Standards Organization
MOR	2-(4-Mprpholiniothio)benzothiazole
MBT	2 Mercaptobenzothiozole
MBTS	Bis (2 benzothioazoyl) disulphide
MH	Highest Modulus
ML	Lowest modulus
pphc	Parts per hundred parts of crumb
pphr	Parts per hundred parts of rubber
rpm	rounds per minutes
SBR	Styrene Butadiene Rubber
STD	Standard Deviation
TBBS	N-tert Butyl 2-benzothiazylesulfenamide

TMQ	2,2,4-Trimethyl -1,2 dihydroquinoline
TMTD	Tetramethyl thiuram disulphide
TMTM	Tetramethyl thiuram monodulphide
ZBX	Zinc butyl xanthate
ZDEC	Zinc diethyl dithiocarbomate
ZDMC	Zinc dimethyl ditiocarbomate
ZIX	Zinc isopropyl xanthate
Zn UFA	Zinc soaps of unsaturated fatty acid

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