

**PHYSICO-MECHANICAL PROPERTIES OF MODIFIED KAOLIN CLAY  
FILLED RUBBER COMPOUNDS**

**M.Sc ( Polymer Technology)**

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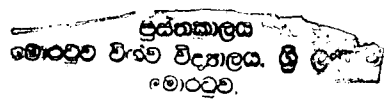


**Physico-mechanical properties of modified kaolin clay filled rubber compounds**

By

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This thesis was submitted to the Department of Chemical and Process Engineering of the University of Moratuwa in partial fulfillment of the Degree of Master of Science in Polymer Technology



Department of Chemical and Process Engineering,  
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October, 2001

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## ABSTRACT

An attempt has made to activate the inert structure of Rubber grade kaolin clays through ion-exchange process. Counter ions absorbed by unsatisfied silicon, oxygen and hydroxyl ions at the edges of planar surfaces of kaolinite mineral to preserve electrical neutrality were replaced with complex organic ions containing active functional groups (amine, hydroxyl, carboxyl) in their organic radicals. Strongly attached to the clay surface these complex ions project their organic aryl or alkyl radicals outwards to suspending medium rubber matrix making inorganic kaolin surface effectively organic and therefore hydrophobic one. Such change in kaolin surface facilitated rubber-filler interaction owing to better wetting of the filler surface with organic rubber polymer and formation of sufficient density grafted polymer layer bonding the rubber matrix to filler.

Carried out physico-mechanical testing of filled rubber compounds showed that modification of kaolin with chosen basic electrolytes ionized in aqueous medium was effective.

Increase in strength characteristics has made possible in commercial practicability of rubber formulation technology the substitution of expensive reinforcing fillers with lowest in cost appropriately modified kaolin Clay.



## Acknowledgements

I am very much grateful to my supervisors Dr ( Mrs) Olga Gunapala and Dr P.Y Gunapala for their encouragement, guidance, and their patience paid through out my research.

Also a special word of thanks to Dr ( Mrs ) B.M.W.P.K .Amarasinghe, the head of the department and Mr S.A. Perera former head of the department and all other academic staff of the Chemical and Process Engineering and the Materials Engineering departments.

My special thanks are due to Mr K Subramaniam, head of the Polymer division, Mrs Shantha Maduwage , Mr P. Weragoda for their great support given me through out my research.

Also I would like to thank technical and technical assistant staff of the Polymer Processing laboratory, Latex and Testing laboratories, Ceramic laboratory and all laboratories of Materials Engineering department. My thanks are due to the officers of Polymer department of ITI providing me the facilities to get the rheographs.

My special thanks are due to Miss Duminda Liyanage , Mrs Samadara Jayarathne, Mr Nalin Gangodavilage and other colleagues for their great support and the encouragement given me to complete my research successfully.

My heartiest gratitude is for my family members for their great support given me through out the research.

Finally, I would like to thank the Asian Development Bank (ADB) for granting me the financial assistance to carry out my research successfully.

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## NOMENCLATURE

DTA	-	Differential thermal analysis
MEA	-	Monoethanol amine
PVA	-	Polyvinyl alcohol
UF	-	Urea formaldehyde
NMR	-	Nuclear Magnetic Resonance
Mix N <sup>0</sup>	-	Mix Number
N	-	Newton
MPa	-	MegaPascal
Q	-	Toluene uptake per gram of Rubber hydrocarbon
u	-	Microns
RSS	-	Ribbed Smoked Sheet rubber
HCl	-	Hydrochloric acid
DPG	-	Diphenyl guanidine.
MBTS	-	2,2, Dithiobis benzothiozole
ZnO	-	Zinc Oxide
DEG	-	Diethyleneglycol
PEG	-	Polyethyleneglycol
H <sub>3</sub> BO <sub>3</sub>	-	Boric acid
NH <sub>4</sub> Ac	-	Ammonium acetate
NH <sub>4</sub> Cl	-	Ammonium chloride
Nm	-	Newton meter

