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DEVELOPMENT OF CARBON BLACK FILLED NR/SBR/BR COMPOSITES SUITABLE FOR TYRE TREADS

BY

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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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Declaration

The work described in this thesis was carried out by me under the supervision of Mrs. Dilhara G. Edirisinghe and a report on this has not been submitted to any University for another degree. Also, I certify that this thesis dose not include, without acknowledgement, any material previously submitted for a degree in any University and to best of my knowledge and belief it dose not contain any material previously published, written or oral communicated by another person except where due reference is made in the text.

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We 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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ABSTRACT

The specific objectives of the research was to develop a tyre tread compound, a composite with NR, SBR and BR having physical properties mainly abrasion resistance, tensile strength, tear strength, hardness and rebound resilience acceptably superior to its virgin materials at an economical price. It is known, that the usage of synthetic rubber reduces some properties of compounds. To what extent synthetic rubber could be incorporated to obtain tyre tread compounds having a balance cost and performance is the theme of this research.

Initially the research was carried out to study the effect of incorporation of synthetic rubber (SBR and BR) into NR compounds and composites were prepared using the single stage mixing technique giving higher preference to Mooney viscosities of the rubbers at blending. Ten samples were prepared with varying the percentages of NR, SBR and BR and tested for physical properties. Then the best four samples were retested by including several extra tests such as rebound resilience and flex cracking resistance.

After selecting the best formulation, investigations were carried out by using a blend of two grades of filler (Carbon black N 330 and N 220) to see the effect on the same properties tested. At the same time, investigations were further extended by increasing the processing oil and same physical property tests were carried out.

In conclusion 50:40:10 NR/SBR/BR ternary blends containing HAF N 330 Carbon black appears to be a better sample having a balanced cost and performance that

the specific mixing cycle used to develop blends. The same blend with HAF N 220 carbon black combination contributed acceptable results as to the industrial requirements, while increasing processing oil did not contribute acceptable results as to the industrial requirements.

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