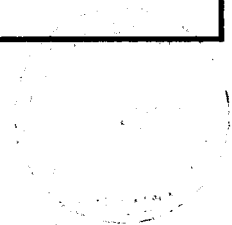


Developing a Sidewall Compound for Agricultural Tires
with Improved Weather Resistance and Flexibility by
Incorporating waste Butyl Rubber Vulcanizates



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Developing a Sidewall Compound for Agricultural Tires with Improved Weather Resistance and Flexibility by Incorporating waste Butyl Rubber Vulcanizates

A thesis presented to the Dept. of Chemical
and Process Engineering,
University of Moratuwa



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In partial fulfillment of the Requirements
for the Degree
Master of Science in Polymer Technology

University of Moratuwa



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DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published written or orally communicated by another person except where due reference is made in the text.

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Supervisor

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Abstract;

Isobutylene – Isoprene Rubber (IIR) which is also known as Butyl Rubber is widely used in tire inner tubes & curing membranes due to its unique properties; impermeability to gas & stability at elevated temperatures respectively. Due to comparatively low unsaturation, Butyl Rubber is known to be cure – incompatible with general purpose rubber. Therefore, preparation of co-vulcanizable blends of Butyl Rubber is not usually recommended.

Pneumatic tire sidewall is subjected to cyclic dynamic deformation under various weather conditions. Among pneumatic tires, agricultural tires are supposed to be used under severe weather conditions especially during soil preparation. On top of that, sidewalls of agricultural tires do possess larger surface area which will be in contact with severe weather conditions. Being agricultural tires are expensive, those tires are supposed to be re-capped at least three times during the life span. To withstand during the period of three lives of treads, the sidewall should possess superior flexibility and weather resistance.

There have been many novel approaches made to achieve weather resistance, in addition to the introduction of PPDs and Anti-ozonant wax. Introduction of polymers derived from butyl rubber were among the modern attempts. Ter polymer of isobutylene, isoprene and di vinyl benzene acts a “pre-cross linked” butyl derivative which can be directly blended with GPR.

The aim of this research project is to enhance weather resistance & flexibility of sidewall compound used in agricultural application by incorporating Butyl Rubber vulcanizates while making it cost effective. Resin cured Butyl rubber vulcanizates can be treated as “pre-cross linked” derivative of Butyl rubber that can be used to improve the performance of sidewall compound.

Used tire curing bags were selected as the starting material and an attempt was made to convert it to a usable material by using a cracker mill. Then, compatibility was achieved by means of “grafting” through carbon black and new side wall compound was developed by blending Butyl rubber curing bag material. Finally, the physical properties and the performance of the sidewall compound were compared against a typical conventional tire side wall compound.

The results of the project reveal that the resistance against initiation and propagation of fatigue cracks in tire side wall can be remarkably improved with the introduction of pre cured butyl rubber and thereby it enhances the performance of tire side wall without making any negative effect on other properties.

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