

PADDY HUSK BASED CARBON BLACK FILLER FOR TYRE COMPOUND

S.D. Ajith Santha Kumara

10/8307



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Saputhanthreege Don Ajith Santha Kumara

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Dissertation submitted in partial fulfillment of the requirements for the Degree Master
of Science in Materials Science

Department of Materials Science & Engineering

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Srilanka

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Declaration

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Signature of the supervisor:

Date:

Mr. Sampath Weragoda

Senior Lecturer,

Department of Materials Science and Engineering,

University of Moratuwa.

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Abstract

Carbon black is a generic term for an important family of products used for the reinforcement of rubber, which is also a black pigment, and an electrically conductive properties of filler material. It is a fluffy powder of extreme fineness and high surface area, composed essentially of elemental carbon. Carbon black is one of thermo-stable product among the chemicals used in rubber compounding.

Carbon black in general is the most widely used filler material in rubber industry. Carbon black is made from hydrocarbon fuel and therefore costly and has to be imported to Srilanka.

Paddy husk is a natural source which can be converted to Carbon black and can be very cost effective. In an Agricultural country like Srilanka, paddy husk is abundantly available and also it would be uplifting to local industry as a readily available renewable raw material source.

Carbon black particle size plays a major role with regard to cured rubber properties. It is directly related to strength of cured article. When a compound is used for tyre tread or plies, Carbon black particle size will be the most critical parameter. Carbon black particle size is not so critical when compounding in tyre bead, inner liner, and chafer compounds.

When Carbon black is to be produced from paddy husk, first, it is under gone pyrolysis in inert atmospheric conditions and converted into carbonized paddy husks. Then, carbonized paddy husk is ground in a grinder and further fined by ball milling. Accordingly it can be made fine 200nm level of particle size which is confirmed by Iodine adsorption number analysis.

As per the tensile, hardness, rheological test results, it was decided to use Paddy Husk Carbon Black (PHCB) for the **inner liner compound of tube type pneumatic bias ply tyre**. Accordingly, differently proportionate compound samples were prepared by replacing the existing normal carbon black with PHCB. Seven compound batches were prepared and rheological and physical properties were analyzed. According to test results, it was found that 40% of Normal carbon black could be replaced by PHCB for inner liner compound. Then selected sample is compared with the existing compound by Ply adhesion, Tear resistance tests and Age analysis so as to confirm suitability of inner liner compound. Further, selected compound was applied in actual tyre and feasibility of curing optimization in a normal manufacturing press is confirmed by thermocouple test.

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