PERFORMANCE OF COCONUT KERNEL RESIDUE OIL AS A PROCESSING OIL IN CARBON BLACK FILLED NATURAL RUBBER COMPOSITES

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ABSTRACT

Use of processing oil in the dry rubber manufacturing is a common practice done to reduce the power consumption, to obtain better dispersion of chemicals in rubber matrix and to get the lubrication effect. The use of currently using processing oils has been banded by the European Parliament and the Council Regulation Concerning since 2009, as they are rich in polycyclic aromatic hydrocarbon which is considered as carcinogenic. Therefore, now the scientists are switching onto naturally occurring oils, instead of fossil fuel based oils. Therefore, a study was conducted to assess the performance of coconut kernel residue oil as a processing oil in carbon black filled natural rubber composite.

Firstly, Coconut kernel Residue Oil (CKRO) was characterized with regard to free fatty acid, moisture, ash content and metal ions (Fe^{+2}, Cu^{+2}) content. Then CKRO was incorporated in different treatment levels (0, 2, 4, 6, 8 and 10 phr) as processing oil in carbon black (CB) filled natural rubber composites. Both curing and physico-mechanical properties of the vulcanizates containing different levels of CKRO were compared against the standard vulcanisate which was prepared by using 6 phr of aromatic oil used in the industry at present.

The results of the present study revealed that, the lowest toque and the maximum toque were decreasing with the increasing processing oil content. Scorch time, cure time and cure rate index were increasing with the increasing of oil phr. Furthermore, there were no significant differences among the oil contents on tensile strength, tear strength and hardness of the compounds within the studied range. Even though, the compression set of all the compounds were not in an acceptable level due to the presence of more free fatty acids. Moduli, tensile stain at break, abrasion volume loss and rebound resilience could be optimized by using coconut kernel residue oil as a processing oil for the tyre tread compound formulation instead of using banded carcinogenic aromatic processing oil.

Key words: Carbon black filled natural rubber, Carcinogenic aromatic oil, Coconut kernel residue oil, Physico-mechanical properties, Processing oil