INFLUENCE OF AROMATIC CONTENT IN RUBBER PROCESSING OILS ON VISCOELASTIC BEHAVIOUR AND MECHANICAL PROPERTIES OF RUBBER FOR TYRE TREAD APPLICATION

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ABSTRACT

In this research, an extensive study has been carried out on the aromatic and polycyclic aromatic (PCAs) contents in rubber processing oils (RPOs) that are capable of affecting different properties (i.e., cure characteristics, rheological properties and mechanical properties) of Styrene Butadiene Rubber (SBR), Butadiene Rubber (BR) and Acrylonitrile Styrene Butadiene Rubber (NSBR) products. Attention was paid to the compatibility between those RPOs that are used and the rubber matrices with different chemical natures.

Results obtained suggest that the variation of aromatic content in RPOs does not affect the bulk viscosity and cure characteristics of the three various rubbers. Due to the aromatic group of SBR and NSBR, the Payne effect is reduced with increased aromatic compounds and PCA contents in the RPOs. This implies that there is an enhancement in the degree of filler dispersion in the rubber compounds, which is due to the increasing compatibility between the RPO and the rubber matrix. In contrast, the compatibility between the RPOs and the BR matrix is relatively low. Furthermore, the variation of aromatic and PCA contents in the RPOs affects properties sensitive to the interaction between aromatic groups in the polymer and those in the RPOs. Both SBR and NSBR vulcanisates provide an increase in tensile strength, elongation at break, and tear strength point with increasing aromaticity of the RPOs, while these properties are comparable for all BR compounds. Regarding the hardness, modulus at 100% strain, abrasion resistance, and compression set, the aromatic and PCA contents in the RPOs play an insignificant role on these properties of all three rubbers. Additionally, the wet grip, dry grip, and rolling resistance performances are not significantly affected by aromatic content and PCA content in the RPOs.

KEY WORDS: RUBBER PROCESS OIL/ AROMATIC OIL/ CURE CHARACTERISTIC/ VISCOELASTIC BEHAVIOUR/ MECHANICAL PROPERTIES

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