

Reinforcement of Natural Rubber vulcanisates Using Mixed Fillers of Carbon Black and Mica

L. Navaneethan¹, U. Jayalath², C. K. Jayasuriya³

¹Department of Science and Technology, Uva Wellassa University, Badulla, Sri Lanka

²CEAT Kelani Holdings (Pvt) Ltd, Sri Lanka

³Department of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka

The current research was carried out to investigate the possible use of mixed fillers of carbon black and mica to reinforce natural rubber vulcanisates. It is expected that the use of reduced amounts of carbon black would minimize environmental effects and allow the production of more cost effective filler system. In addition, the use of mica as a filler material would make a value addition to mica which is one of the mostly available minerals in Sri Lanka. Mica was ground into powder and was kept at 80 °C for 24 hours. The powder having the particle size in the range of (63 -125) pm was separated. Seven compounds were prepared according to the tire inner layer compound formulation by varying the relative amounts of carbon black and mica. Processing characteristics of compounds were investigated by using a Rheometer. Vulcanized samples were prepared using a hydraulic press maintaining at 160 °C for 20 minutes. Tensile and tear tests were carried out using a Tensometer. Hardness was carried out by using a Durometer. Tensile and tear strengths of the samples prepared with mixed fillers have been decreased compared to the reference sample. The modulus has been increased with increasing the amount of mica. Hardness has been improved only when small amounts of silica were replaced by mica particles. Diminishing properties could be due to undesired particle size of mica incorporated and non-uniform dispersion which interferes the process of crosslinking. Possible phase separation of mica and carbon black when higher amounts of mica are used could also be another reason. Further studies on the structure determination of the two types of particles incorporated are required to confirm the causes for observed variations. Such studies will also allow determining the best conditions for achieving reinforcing effects.

Keywords: Natural-rubber, Carbon-black, Mica, Reinforcement