Influence of Partial Replacement of Carbon Black with Areca Nut Husk Fiber on Properties of Natural Rubber Composites

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Development of Natural Rubber (NR) composites using natural fibers (NF) such as coconut, bamboo, banana, sisal, etc. has been increased during the recent past due to the growing need for green rubber composites. NF are low density and low cost materials having high recyclability and biodegradability. However, compatibility between NF and NR is not adequate to achieve properties required for various applications. Areca nut husk is one of the good sources of NF which is abundantly present as a waste. One series of composite was prepared with six NR composites using carbon black (N 330) and surface treated (with silane coupling agent) Areca nut husk fibre (SAF) by varying the SAF loading from 0 to 50 phr at 10 phr intervals, whilst maintaining the total filler loading at 60 phr. Another series with six NR composites was also prepared using the same formulation, but with untreated Areca nut husk fibre (UAF). UAF and SAF composites were characterized using Fourier Transform Infrared Spectroscopy (FTIR). Cure characteristics and physico-mechanical properties of these composites were tested to select the best ratio of the two filler materials in terms of properties for low cost applications. Cure rate decreased, however scorch safety improved with the increase of the amount of SAF in the composite. Hardness, tensile strength and tear strength decreased, whilst resilience, abrasion weight loss and compression set increased with the increase of SAF loading. Results indicated that two third of the carbon black in NR composites could be replaced with SAF without a significant effect to the properties.

Keywords: Areca nut husk fiber, Natural rubber, NR composites, Reinforcement of rubber, Surface treated fiber