

Evaluation of Performance of Modified Graphene Based Materials in Tire Tread Formulations

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Tire tread is the outer part of the tire that contacts the road or the ground. To improve its performance, effectiveness of different types of additives has been studied in various researches. Graphene which is considered as the basic structural element of carbon allotropes shows unique properties like excellent thermal conductivity, high strength, and relatively lower density. Therefore, it can be used as an additive in tire tread formulations because enhancing mechanical and thermal properties of tire is an important factor in modern tire industry. In this research, the possibility of synthesizing graphene and/or exfoliated graphite from a ball milling technique has been studied. Also, the properties of the composites of Natural rubber and Exfoliated graphite have been studied. This research is aimed to improve mechanical and thermal properties of tire treads using modified graphene-based materials. Optical microscopy, SEM analysis and Raman spectroscopy were used to characterize exfoliated graphite. Rubber compounds were mixed in a two-roll mill according to a predetermined formulation and were vulcanized using a compression molding machine. Rheological properties of the compounds were characterized by Moving Die Rheography and physical and thermal properties of vulcanizates were obtained using tensile test and Lee's disk method respectively. Final results show that the exfoliated graphite has enhanced the thermal conductivity and physical properties of tire tread compounds.

Keywords: Exfoliated graphite, Tamol, Vulcanizates