Evaluation of Performance of Modified Graphene based Materials in Latex Films

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Natural rubber (NR) is one of the main natural materials used in various industrial applications. In order to tailor the natural rubber material according to the end application, natural rubber latex compounding is done, introducing various additives. Fillers are one of the major categories of additive in a latex compound which reduces the cost while catering the final performance of the product. In latex film manufacturing the widely used filler Silica (SiO_2) is an inorganic compound which consists of hydroxyls on its surface which impart poor dispersion properties in an organic matrix such as rubber. Surface hydroxyl groups lead to agglomeration of silica particles which directly affects the mechanical properties of NRL thin film products. This issue has been discussed in both academic and industry environments; thus, many studies have introduced different coupling agents such as silane, alkanol amide, polydiallyl dimethylammonium chloride (PDDA) etc. Natural rubber composites filled with Silica, graphite and its derivatives, and modified silica with various forms of graphite have been studied. This research is aimed to improve of filler rubber interaction of silica filled NRL thin films in the presence of exfoliated graphite. Here, Graphite was exfoliated by using a ball milling method assisted with a Naphthalene sulphonic acid derivative (i.e. Tamol) and was used to improve the aqueous dispersion of silica to improve filler-rubber interaction through inter molecular attraction. Optical microscopy, SEM analysis and Raman spectroscopy were used to characterize exfoliated graphite. Properties of vulcanizates were characterized by tensile strength test, tear strength test, swelling test, and SEM analysis. Overall results show that introduction of exfoliated graphite into silica dispersion has enhanced its properties imparting some improvements in physical properties of NRL thin films.

Keywords: Natural rubber, Exfoliated graphite, Latex film resonance (LSPR),