Abstract

The present study explored the effect of different reinforcing nanofillers like organoclays, expanded graphite (EG) and graphene oxide (GO) on the morphology, mechanical, thermo-mechanical, thermal and barrier properties of different elastomer vulcanizates. As most of the nanofillers are inorganic in nature so these are not miscible with the organic polymer matrices. Due to this immiscibility issue, these nanofillers impart lower reinforcing effect to the different polymer matrices than that of carbon black (CB). The primary target in synthesizing different nanofillers loaded rubber composites is to get better dispersion of nanofiller agglomerates that produces very large surface area, which considerably enhances the mechanical, dynamic mechanical, thermal and barrier properties of the rubber vulcanizates. The attainment of highly dispersed organoclay rubber composites is associated with two main factors. The leading aspect comprises the miscibility between the rubber and nanofiller particulates, in order to get superior dispersion of the nanofiller in the rubber matrix. The additional factor is the technique adopted for the synthesis of the nanocomposites. In the present investigation, carboxylated styrene butadiene rubber (XSBR) is used as compatibilizer between the different nanofillers and nonpolar rubber vulcanizates. Solution intercalation and direct mixing techniques are used to prepare different rubber nanocomposites. Different nanofillers are modified to improve their dispersion in the rubber matrices, and also to increase the interfacial adhesion between nanofillers and the rubber matrices. The influences of compatibilizer and surface modification of the nanofiller particulates on the overall properties of the rubber vulcanizates are widely investgated. Modified nanofillers filled rubber composites in the presence of a compatibilizer show better mechanical, thermo-mechanical, thermal and barrier properties compared to the unmodified fillers loaded rubber composites.

Keywords: *Polymer composites; Compatibilizer; Organoclay; Expanded graphite; Rubber; Graphene oxide*