IN SITU PREPARATION AND PROPERTIES OF EPDM/SIO_2 NANOCOMPOSITES

TH Mokhothu and AS Luyt

Department of Chemistry, University of the Free State (Qwaqwa Campus), South Africa
(E-mails: MokhothuTH@qwa.ufs.ac.za, LuytAS@qwa.ufs.ac.za)

ABSTRACT

Ethylene-propylene-diene monomer (EPDM)-silica nanocomposites were prepared by means of *in situ* synthesis of the polymer filled with silica particles prepared by sol-gel hydrolysis and condensation of an inorganic precursor (tetraethoxysilane, (TEOS)). This type of analysis provides a good dispersion of the particles inside the rubber matrix. The investigations were mainly focused on the effect of the silica concentration and the presence of coupling agent (bis(3-triethoxysilylpropyl)disulfide on the morphology, crosslink density, thermal properties, mechanical properties and thermomechanical properties of the nanocomposites. The properties were determined using scanning electron microscopy (SEM), transmission electron microscopy (TEM), thermogravimetric analysis (TGA), tensile testing, dynamic mechanical analysis (DMA), swelling tests and gel content determination. Compatibility between the silica nano-particles and the EPDM rubber matrix is necessary, as the morphology has a significant effect on the composite properties. The SEM and TEM analyses showed that the particles remained well dispersed with good adhesion between the filler and the matrix. Swelling and extraction tests indicated a reduction in the degree of crosslinking of the rubber matrix, which shows that the *in situ* generated silica particles have an observable influence on the vulcanization process. The TGA results showed an improved thermal stability with increasing filler content. The DMA and tensile results showed a significant improvement on the mechanical properties due to the presence of the reinforcing filler.