INVESTIGATIONS OF NITRILE RUBBER COMPOSITES CONTAINING IMIDAZOLIUM IONIC LIQUIDS

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ABSTRACT

Recently ionic liquids (ILs) have attracted increasing attention due to their appealing physical and chemical properties, such as low melting point, negligible vapor pressure, non-volatile, high thermal stability, and high ionic conductivity[1,2]. ILs have proved to be sustainable alternatives for many applications in industry and chemical manufacturing. Ionic liquids were also considered effective additives in rubber compound formulations. Commonly, ionic liquids are used in the field of elastomers for improving the dispersion of nanofillers, such as carbon nanotubes or carbon black, in the rubber matrix as well as for enhancing ionic conductivity and the thermal and mechanical properties of polymer composites[3-9]. The combination of elastic polymer and ionic liquids is expected to generate a semi-conductive elastomeric material with good mechanical properties.

The goal of this work was to investigate the influence of hydrophilic and hydrophobic imidazolium ionic liquids on the curing kinetics, mechanical, morphological, thermal and conductive properties of acrylonitrile-butadiene rubber (NBR) composites. It was found that used ionic liquids improved the conductivity of NBR composites as well as influenced the rheometric behavior and mechanical properties. Addition of 1-ethyl-3-methylimidazolium thiocyanate (EMIM SCN) at 5 phr concentration led to effective crosslink formation. NBR - based composites exhibited elastomeric properties and high tensile strength up to 23 MPa when phr 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide (EMIM TFSI) was added. Compared to EMIM SCN, the use of EMIM TFSI more efficiently improved the ionic conductivity without a deterioration of mechanical properties. DSC analysis showed that the T_g of NBR/SiO_2/IL systems slight decreased as a function of increasing EMIM SCN ionic liquid content.

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