Rubber nanocomposites with segregated network of multiwalled carbon nanotubes

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Segregated electrically conductive polymer nanocomposites (s-CPCs) have conductive fillers segregated at the interfaces of the polymer particles instead of being randomly dispersed in the polymer matrix. Rubber nanocomposites with segregated structure of Multiwalled carbon nanotubes (MWCNTs) have been prepared by latex technology. Natural rubber (NR) and Carboxylated acrylonitrile rubber (XNBR) are used as the polymer matrices and MWCNT is used as the conducting nanofiller. Surfactant assisted sonication has been done to get stable aqueous dispersions of MWCNTs. An alternate method without using surfactant includes the oxidation of nanotubes in acidic environment which make them hydrophilic and assists in forming stable dispersions in water. Latex stage mixing of the aqueous dispersions of MWCNTs to the rubber followed by film casting resulted in composites with beautiful network of nanotubes inside rubber which has been confirmed from TEM images. Fracture surface morphologies as per SEM studies also support the segregated network inside both NR and XNBR. The composites exhibited good mechanical and solvent barrier properties. Very low percolation threshold obtained from electrical conductivity studies confirmed the segregated network structure in which individual CNTs are aligned along the periphery of the rubber particles in the composite. The composites exhibited excellent dielectric properties which make them promising in the capacitor applications.

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