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Tensile and Dielectric Properties of Tin Dioxide Reinforced Deproteinized Natural Rubber Nanocomposites for Electrical Insulator

Abstract

Tin dioxide, SnO2 nanoparticles combined with deproteinized natural rubber could be an effective electrical insulator that inherits its parents' insulation and conductivity. The deproteinized natural rubber (DPNR) nanocomposites containing uncalcined SnO2 nanofillers at 0.5, 1.0, 3.0, and 7.0 phr were investigated for tensile and dielectric properties. The nanocomposites were prepared using a Haake internal mixer through a melt compounding method and vulcanized by a semi-EV system. Their properties were explored and compared with the DPNR vulcanizate. The highest tensile strength of about 28 MPa was obtained at 3.0 phr SnO2 loading. The elongation at break increases with the increase of nanofiller loading up to 3 phr and then decreases. With a rise in SnO2, the dielectric constant decreased but increased once 7 phr SnO2 was added. The nanocomposites exhibited the minimum dielectric constant at the optimum SnO2 loading of 3.0 phr. Therefore, the SnO2-reinforced DPNR nanocomposites are promising to be further explored for a stretchable electric insulator material.

Keywords

Dielectric properties; Electrical insulator; Rubber nanocomposites; Tensile properties; Tin dioxide