JOURNAL OF THERMOPLASTIC COMPOSITE MATERIALS

Original Article

Journal of Thermoplastic Composite Materials
2018, Vol. 31(2) 265–287

DOI: 10.1177/0892705717697778
journals.sagepub.com/home/jtc
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Ternary NR/BR/SBR rubber blend nanocomposites

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Abstract

The goal of this work was to synthesize and characterize ternary rubber blends based on polyisoprene (natural rubber (NR)), polybutadiene rubber (BR), and styrene–butadiene rubber (SBR) (NR/BR/SBR = 25/25/50) reinforced with different loading silica (SiO_2) nanoparticles (0–100 part per hundred parts of rubber (phr)). The specimens were subjected to thermooxidative aging at 100°C, for two times: at 72 and 168 h, respectively, and then mechanically stretched to fracture by tension with a Zwick 1425 (Zwick GmbH, Ulm, Germany) universal tensile testing machine. Rheological and mechanical properties were used as characterization of the ternary rubber blends. The reinforcing performance of the filler was investigated using rheometric, mechanical, and swelling measurements, thermogravimetric analysis, scanning electron microscopy, and Fourier transform infrared spectroscopy with attenuated total reflectance. Hardness, tensile strength, elongation at break, and swelling degree were assessed before and after thermal aging. There was a remarkable decrease in the optimum cure time (t_{c90}) and the scorch time (t_{s2}), which was associated with a decrease in the cure rate index of (NR/BR/SBR = 25/25/50) ternary rubber blend with 60 phr of filler loading. Interaction between rubber blend and SiO_2 nano-filler is confirmed by moving absorption band from 1450 cm^{-1} to 1480 cm^{-1}.

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