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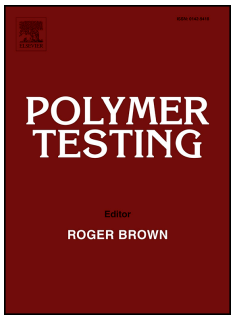

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Mechanical and rheometric properties of gilsonite/carbon black/natural rubber compounds cured using conventional and efficient vulcanization systems

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Abstract

The effect of adding gilsonite micrometric particles on the properties of N330 carbon black (CB) reinforced natural rubber (NR) compounds was investigated. Formulations with 30/0, 22.5/7.5, 15/15, 7.5/22.5 and 0/30 parts per hundred of rubber (phr) of CB/gilsonite were used, comparing the effect of conventional and efficient vulcanization systems. Gilsonite was characterized by X-ray fluorescence (XRF), thermogravimetric analysis (TGA), elemental analysis, X-ray diffraction (XRD) and scanning electron microscopy (SEM). Tension, uniaxial compression, compression-set, abrasion resistance and dielectric strength tests were carried out on specimens that were moulded using the optimal curing time measured by oscillating disc rheometry (ODR). Abrasion wear resistance, and mechanical and rheometric properties varied with the CB/gilsonite content and on the vulcanization system. It was found that gilsonite facilitated the incorporation of carbon black during mixing, diminished the reversion during rheometric tests of compounds with efficient vulcanization cure systems and increased the dielectric strength. Some gilsonite/CB/NR compounds showed similar rheometric properties, compressive modulus and wear resistance to CB/NR compounds, which evidenced the use of gilsonite as an available filler for NR-based materials.

Keywords: vulcanization systems, gilsonite, natural rubber, rubber-filler interaction

Introduction

Natural rubber (NR) reaches 40% of rubbers worldwide consumption. NR is a widely used elastomer obtained from the latex of some plant species, among which the *Heveas brasiliensis* tree is the most commonly used in the industry [1]. An NR article manufacturing begins with