

عنوان مقاله:

Natural rubber/natural rubber reclaim nanocomposites: Role of functional nanoparticles, mixing sequences and coupling agents

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خلاصه مقاله:

Elastomer vulcanizates based on natural rubber (NR), NR reclaim (NRR) and layered silicates were compounded in an internal mixer and cured on a two-roll mill. Cure characteristics and mechanical properties of samples based on 50NR/50NRR reinforced with Cloisite 20A, Cloisite 30B and Nanolin DK1 were compared to those of conventional NR/NRR/kaolin microcomposites. Due to the light/soft nature of organoclays suppressing the friction forces, the minimum torque values decreased in the presence of organoclays, whereas the crosslink density, evidenced by the difference between the maximum and minimum torque values, increased in all samples and scorch times shortened by 37% to a minimum in the presence of Nanolin alkaline/catalytic role in the cure reaction. Fatigue resistance improved by about 10% benefiting the crack tips blunting/energy consuming hysteresis mechanisms motivated by the organoclays among which Nanolin DK1 provides the most efficient dispersion/distribution of nanolayers by faster intragallery crosslinking reactions that pushes the stacks apart. Higher states of dispersion in this sample would also promote strain-induced crystallization under deformation responsible for the improvements seen in the modulus and elongation-at-break. Two-step mixing sequence further improved the compound performance due to the dispersion state progress confirmed by X-ray diffraction and transmission electron microscopy (20% in fatigue resistance and 53% in tensile modulus). In-situ compatibilization through bis(triethoxysilylpropyl)tetrasulfide bi-functional silane coupling agent also promoted modulus and fatigue resistance. However, a prolonged scorch time was observed due to the blinded NR cure-reactive sites as well as steric hindrance of large functional groups in the presence of this coupling agent.

کلمات کلیدی:

NR, Reclaimed NR, organoclay, Mixing sequence, Coupling Agent

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