THE EFFECTS OF NANO CLAY ON THE MECHANICAL PROPERTIES OF THERMOPLASTIC NATURAL RUBBER

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ABSTRACT

This paper reports the improvement of a thermoplastic natural rubber (TPNR) composite toughened by the combination of nanoclay. The main objective of this work is to obtaining the quaternary nanocomposite with the mechanical properties such storage modulus, loss modulus and tan delta. The mechanical properties have been evaluated using Dynamic Mechanical Analysis (DMA) on pure TPNR, 3%, 6%, 9% and 12% of nanoclay by different frequency 1Hz and 10Hz. The results show storage modulus increase as the composition of nanoclay increase and as frequency increase because the molecules of bound part are restricted to the surface of the filler, the molecular motion is greatly limited. The loss modulus is decrease as the composition of nanoclay increase and as frequency increase due to the clay has formed an agglomeration of clay inside the matrix. The glass transition (t_g) temperature also decrease as the composition of nanoclay increase and as frequency increase because of reduced mobility of the chains due to a strong interaction with the high specific surface nanofiller.

CHAPTER 1

1.0 Introduction

Reinforcement of polymer with nanosized particles is a promising technique that affords to enhanced performance of the materials. Recently, nano clay has received much attention because by adding minimal concentration of clay to thermo plastic neutral rubber (TPNR) mechanical properties has been achieved. The influences of nano clay content and rubber modification on the morphology and mechanical properties of the blend nano clay were studies. DMA has attracted ever more attention recently, because it provides a sensitive and non-destructive detection of the interfacial region.

The technique separates the dynamic modulus (E') of the material into two distinct parts: an elastic (storage) part (E') and a viscous (loss) component part (E"). The ratio of E" to E' (E"/E') gives the tangent of the phase angle δ, tanδ, which is known as the damping and may be regarded as a measure of energy dissipation of the material. By using the curve of tanδ, glass transition temperature (T_g) can be obtained, which may also be used to evaluate the material characters .

This improvement combined with NR cross linking occurring during chemical modification, resulted in very significant increase of tensile strength and elastic modulus as compared. In spite of the superior reinforcing efficiency commonly observed in polymer/clay nanocomposites, the