ADVANCES IN MATERIALS ENGINEERING

Volume 1

Edited By:
Zahurin Halim
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Preparation and Characterization of Thermoplastic Natural Rubber (TPNR) Nanocomposites

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Abstract. Thermoplastic natural rubber nanoclay filled composite was prepared using a melt blending technique. TPNR was prepared in the ratio of (70:20:10) from LLDPE, NR and LNR as a compatibilizer. The clay used was sodium bentonite (smectite clay). X-ray diffraction of thermoplastic natural rubber matrix and smectite clay indicates that intercalation-exfoliation of the TPNR into silicate interlayers for the nanoclay. The glass transition temperature of TPNR/clay nanocomposites obtained from dynamic mechanical analysis (DMA) was higher than TPNR matrix. The storage modulus of the nanocomposites increased with increasing nanoclay content. The interaction between the matrix and the fillers remarkably affects the dynamic mechanical properties of the nanocomposites.

Introduction

Polyolefin is one of the most common resins, owing to their low density good processability and low cost. They are widely used in diverse application such as vehicles, agriculture facilities, construction materials, electronic and sporting goods. However, the use of the polyolefin is restricted because of their several drawbacks such as lower strength, poorer heat resistance and others.

Thermoplastic natural rubber (TPNR) is a blend of rubber and thermoplastic and most probably the fastest growing sector in the polymer market [1-3]. The main advantages of these materials are that the thermoplastic machinery for processing does not require factory compounding or vulcanization and the scrap and rejects can be reprocessed. The rubber phase is partially cross-linked and thereby produces a morphology involving microphase separation responsible for the unique properties of the material.

Smectite nanoclay with huge surface area is widely used in polyolefin composites. Its application is now mainly focused on the improvement of mechanical and optical properties such as stiffness, gas barrier, flammability and etc. This paper, described the effect of nanoclay content on the dynamic mechanical properties of TPNR, which provide important information of the viscoelasticity of the composites over a wide temperature range.

Experiment

Materials and Preparation. Linear low density polyethylene (LLDPE) used in this study was supplied by Exxonmobil Chemical Corporation with the density 0.918gcm^{-3}. The natural rubber (NR) type SMR-L with density 0.91gcm^{-3} was supplied by Guthrie (M) Bhd. Liquid natural rubber