

EPOXIDISED NATURAL RUBBER LAYERED SILICATES NANOCOMPOSITES

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Received : 11 April 2013 Accepted : 10 May 2013

Madhusoodnanan, K.N. and Varghese, S. (2013). Epoxidised natural rubber layered silicates nanocomposites. *Rubber Science*, 26(1): 142-147.

Polymer/layered silicate nanocomposites exhibit remarkable improvement in mechanical and barrier properties compared to their virgin polymers or microcomposites. Nanoclay being organophilic are more compatible with polar polymers. Epoxidised natural rubber (ENR), a polar form of natural rubber is expected to show high affinity and better performance with layered silicates. Epoxidised natural rubber nanocomposites were prepared by melt compounding of ENR having an epoxy content of 50 mole per cent at ambient temperature. Two grades of organically modified montmorillonite (MMT) having layer distances of 2.1 and 1.85nm were used in this study. Accelerated sulphur curing system was used for the vulcanization of the composites. For comparison, commercial clay was included in this study and the filler loading was kept at 10 phr in all mixes. The cure characteristics and mechanical properties were evaluated. The dispersion of the silicate in the matrix was studied by transmission electron microscopy (TEM). The addition of modified MMT to the ENR reduced its cure time and scorch time. The maximum torque was higher for these composites. The montmorillonite filled composites showed better mechanical properties when compared to the reference material. The enhancement in properties was believed to be due to the partial exfoliation/intercalation of the layered silicates in ENR. Among the two types of nanoclays, the one having higher inter-layer distance showed better mechanical properties.

Keywords: Epoxidised natural rubber, Exfoliation, Intercalation, Layered silicate, Montmorillonite, Nanocomposites

INTRODUCTION

Nanocomposites are a new class of materials, which exhibit excellent barrier, mechanical, thermal, optical and physico-chemical properties, compared to the corresponding microcomposites. Nanocomposites can be categorized into three depending on how many dimensions of the dispersed particles are in the nanometer range. When all the dimensions are in the order of nanometers such as silica

nanoparticles, they are called isodimensional nanoparticles (Mark, 1996; Reynaud *et al.*, 1999; Von Werne *et al.*, 1999). Nanotubes or whiskers (Calvert *et al.*, 1996; Favier *et al.*, 1997; Chauzeau *et al.*, 1999) are included in the second category where two dimensions are in the nanometer scale. The third type, having only one dimension in the nanometer range is layered silicates nanocomposites. These materials are obtained by the intercalation of the polymers inside the galleries of layered silicates.