

THERMAL CHARACTERIZATION OF ELASTOMERIC HYBRID COMPOSITES WITH SHORT NYLON-6 FIBRE

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Nanosilica prepared by acid hydrolysis of sodium silicate under controlled conditions was used as additional filler and as a component of the HRLI dry bonding system in short nylon 6 fibre-elastomer composites based on natural rubber (NR), acrylonitrile butadiene rubber (NBR) and styrene butadiene rubber (SBR). Their thermal degradation was studied by thermogravimetric analysis (TGA). The kinetics of the degradation was analysed using Freeman-Carroll equation. The short nylon fibre improved the thermal properties of the composites based on NR, SBR, and NBR. The introduction of nanosilica improved the thermal stability of the composites better than commercial silica. The onset temperature (Ti) of degradation of NBR and SBR based composites was almost in the same range. NR composites showed a lower Ti value. Among the three types of elastomeric composites NR based composites showed the lowest peak degradation temperature (Tmax). All the composites showed two-step degradation process. In the case of NR composites the first degradation peak corresponds to the degradation of natural rubber and the second to the degradation of the nylon fibre. Studies showed that the degradation of all the three elastomeric composites followed the first-order kinetics.

Key words: Composites, Nanosilica, Nylon-6, Short fibres, Thermogravimetric analysis.

INTRODUCTION

Thermal analysis is considered as an important analytical method in understanding the structure property relationship and mastering the technology for the industrial production of different polymeric materials. Thermal stability of an elastomer can be improved by adding short fibres (Kutty *et al.*, 1992; Younan *et al.*, 1995; Suhara *et al.*, 1998; Rajceev *et al.*, 2003 a.) and inorganic nanofillers

(Wei *et al.*, 2004). Strong interaction between the polymer and the filler particles is essential for achieving good mechanical properties and thermal stability (Reddy and Das, 2005; Mahaling and Das, 2005; Xiang *et al.*, 2006; Mahaling *et al.*, 2007 and Qianping *et al.*, 2008). Dunnorn (1967) observed a marked difference in the adhesion between the matrix and the fibre by adding hydrated silica to a compound containing resorcinol and