

Preparation and characterisation of crosslinked polycaprolactone and natural rubber (SMR CV60) blends

Abstract

Polycaprolactone (PCL) and natural rubber (NR) blends were prepared using a melt blending process, in the absence and presence of an organic peroxide crosslinking agent. The resulting blends were then characterised for their functional groups using Fourier transform infrared analysis (FTIR), surface morphology using scanning electron microscopy (SEM), crosslink degree using gel content measurements, physical properties using tensile measurements and viscoelastic properties using dynamic mechanical analysis (DMA). FTIR analysis revealed the reduction in C=O stretching and C–O bending of PCL due to crosslinking whereas SEM analysis showed rougher and more irregular surfaces with holes and grooves as well as increasing PCL concentration. Similarly, surfaces with holes after extraction with acetone were also observed using SEM. Gel content experiments showed an increase in gel content of the blends with crosslinking, which reduced with increasing PCL concentration. On the other hand, tensile strength and modulus at 300% increased after crosslinking and PCL concentration. However, the elongation at break after crosslinking showed an opposite increasing effect. DMA showed that crosslinking resulted in a more elastic blend behaviour with an increase in the glass transition temperature, T_g for all blend ratios.

Keyword: Crosslinked; Polycaprolactone; Natural rubber (SMR CV60) blends; Fourier transform infrared analysis.