

The Effect of Temperature on the Rheology of PS/SEBS Blends

S. Raha, N. Kao and S. N. Bhattacharya*

Rheology and Materials Processing Centre
School of Civil and Chemical Engineering, RMIT University
Melbourne, Australia

ABSTRACT

Polystyrene (PS) was blended with styrene-b-ethylene/butylene-b-styrene triblock co-polymer (SEBS). The morphology of these blends was investigated and their rheological behaviour at different temperatures was studied. PS was blended with SEBS using a twin-screw extruder. The morphology of these PS/SEBS blends was investigated by using an Environmental Scanning Electron Microscope (ESEM). Morphological studies showed formation of co-continuous lamellar structures in the blends when SEBS concentration was in the range of 30 to 70 wt%, whereas a droplet/matrix and a single-phase system were found at the low end (<30 wt%) and the high end (>70 wt%) of the concentration spectrum, respectively. Dynamic rheological behaviour of these blends were studied using a parallel plate strain-controlled rheometer within a frequency range of 0.1 rad/s to 100 rad/s at temperature range from 180°C to 210°C. The dynamic results showed that the time-temperature-superposition principle was applicable for these blends, and it was used to produce the master curves of the storage modulus and the dynamic viscosities. The Arrhenius equation was used to obtain the activation energies of the blends, with all blends showing similar values. The applicability of the time-temperature-superposition principle showed that there were no appreciable trend changes in dynamic behaviour with temperature, indicating stability of morphology in the temperature range investigated.

Keywords: PS/SEBS blends, co-continuous morphology, lamellar nano-structure, time-temperature-superposition, dynamic rheology.

* Presenting and corresponding author:

Dr. Nhol Kao
School of Civil and Chemical Engineering
RMIT University
GPO Box 2476V
Melbourne 3001 Victoria Australia

Phone: +61 3 9925 3257
Email: nhol.kao@rmit.edu.au