Rheological, Mechanical and Biodegradation Studies on Blends of Thermoplastic Starch and Polycaprolactone

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Polycaprolactone (PCL) has been blended with thermoplastic starch (TPS), prepared from regular corn starch and glycerol, in a twin-screw extruder. The rheological, mechanical, thermal and morphological properties of the blends were examined. Differential Scanning Calorimetry (DSC) and Scanning Electron Microscopy (SEM) studies revealed that PCL/TPS blends are thermodynamically immiscible. However, they form compatible blends due to the hydrogen bonding interaction between the ester carbonyl of PCL and the –OH groups on starch. Biodegradability of the blends increased with increasing TPS content. Dynamic viscoelastic measurements concluded that blends containing above 60-wt% TPS had higher storage and loss moduli as compared to those of pure TPS and PCL. In addition, these blends had higher complex viscosities.