ACS Appl. Mater. Interfaces 2012, 4, 6690-6701

dx.doi.org/10.1021/am301842e

Role of Specific Interfacial Area in Controlling Properties of Immiscible Blends of Biodegradable Polylactide and Poly[(butylene succinate)-co-adipate]

Vincent Ojijo, Suprakas Sinha Ray and Rotimi Sadiku

ABSTRACT:Binary blends of two biodegradable polymers: polylactide (PLA), which has high modulus and strength but is brittle, and poly[(butylene succinate)-co-adipate] (PBSA), which isflexible and tough, were prepared through batch melt mixing. The PLA/PBSA compositions were 100/0, 90/10, 70/30, 60/40, 50/50, 40/60, 30/70, 10/90, and 0/100. Fourier-transform infrared measurements revealed the absence of any chemical interaction between the two polymers, resulting in a phase-separated morphology as shown by scanning electron microscopy (SEM). SEM micrographs showed that PLA-rich blends had smaller droplet sizes when compared to the PBSA-rich blends, which got smaller with the reduction in PBSA content due to the differences in their melt viscosities. The interfacial area of PBSA droplets per unit volume of the blend reached a maximum in the 70PLA/30PBSA blend. Thermal stability and mechanical properties were not only affected by the composition of the blend, but also by the interfacial area between the two polymers. Through differential scanning calorimetry, it was shown that molten PBSA enhanced crystallization of PLA while the stiffPLA hindered cold crystallization of PBSA. Optimal synergies of properties between the two polymers were found in the 70PLA/30PBSA blend because of the maximum specific interfacial area of the PBSA droplets.