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Nucleation and Growth in Poly(L-lactic acid)/clay nanocomposites VAHIK KRIKORIAN, DARRIN POCHAN, University of Delaware and Delaware Biotechnology Institute — We have investigated the crystallization behavior of semicrystalline poly (L-lactic acid) (PLLA) upon addition of organically modified montmorillonite clay. The real-time crystallization was probed by Polarized Optical Microscopy (POM), Differential Scanning Calorimetry (DSC) and Fourier Transform Infrared Spectroscopy (FTIR) techniques. The exfoliation-adsorption technique was employed to fabricate the nanocomposites from solution. Crystallization studies were performed on cast nanocomposite films, which were isothermally recrystallized at different temperatures from the quiescent melt. The radial spherulite growth rate measurements and isothermal bulk crystallization kinetics indicate that the silicate layers, in the case of the fully miscible organic modifier, did not act as a nucleating agent. However, the less miscible clay acted as a good nucleating agent and significantly decreased the spherulite sizes. Interestingly, spherulite growth rates were significantly increased by the addition of organoclays, being the highest in the fully exfoliated case. Despite the increase in spherulite growth rate, the overall bulk crystallization rate was retarded in the exfoliated nanocomposites. The bulk crystallization rate was increased in the intercalated case in which clay acted as a good nucleating agent. In-situ FTIR studies revealed a valuable insight into the chain configurations, which are in good accordance with the DSC and POM experiments

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