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Studies on Miscibility in Blend of Polylactide and Polycarbonate

S. Ono, *T. Ougizawa

Department of Organic and Polymeric Materials, Tokyo Institute of Technology, Japan

Poly(L-lactide) (PLLA) is a plastic of plant origin and biodegradable. However, PLLA is brittle and shows a low glass transition temperature. In order to overcome these drawbacks, the blends with another polymer have been considered. In this study, the miscibility of a blend of PLLA and bisphenol-A polycarbonate (PC) was investigated. Though the solvent cast film of PLLA/PC=70/30 from chloroform solution became transparent at room temperature, the phase separation took place via spinodal decomposition during annealing at 250 °C as shown from a light scattering measurement and an optical microscope observation. However, by annealing more the phase dissolution took place and lastly the blend specimen became transparent again. From a measurement of differential scanning calorimetry, only one glass transition temperature was observed and the melting peak of PLLA crystal disappeared. This means that the specimen becomes one phase state. In order to study this reason, a measurement of ¹³C-NMR was carried out. Generation of D-isomer by annealing at high temperature was observed. Namely, the isomerization from L-lactide to D-lactide took place and random copolymers consisting of D- and L-lactide (PDLLA) were generated by annealing. It is considered that PDLLA may be miscible with PC, though PLLA is immiscible with PC.