Synthesis of High-Molecular-Weight Poly(L-Lactic acid)-Based Copolymers via in situ Direct Condensation Polymerization

김훈식, 양혜선[1], 김말남[1], 윤진산*
인하대학교 고분자공학과; [1]상명대학교 생물학과
(jsyoon@inha.ac.kr*)

Poly(L-lactic acid-co-succinic acid-co-1,4-butanediol)(PLASB) was synthesized by a direct condensation copolymerization in bulk state using titanium(Ⅳ) butoxide(TNBT) as a catalyst. Weight average molecular weight(Mw) of PLASB increased from 3.5×10^4 to 2.1×10^5 as the content of SA and BD went up from 0.01 to 0.5 mole/100 mole of L-lactic acid(LA). PLASB having Mw in the range from 1.8×10^5 to 2.1×10^5 showed tensile properties comparable to those of commercially available poly(L-lactic acid)(PLLA). In sharp contrast, homopolymerization of LA in bulk state produced PLLA with Mw as low as 4.1×10^4, and it was too brittle to prepare specimens for the tensile tests. PLASB synthesized by using various catalyst. Ethylene glycol oligomers with different chain length were added to LA/SA in place of BD to investigate effect of chain length of ethylene glycol oligomers on the Mw of the resulting copolymers. Biodegradability of PLASB was analyzed by using the modified Sturm test. Toxicity of PLASB was evaluated by counting viable cell number of mouse fibroblast cells which had been in contact with PLASB discs.