

论文

左旋聚乳酸的结晶行为研究

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摘要:

用DSC, WAXD和POM对Zn催化剂制备的左旋聚乳酸(PLLA)的熔体结晶行为进行了研究. 在95~125 °C范围内, PLLA熔体结晶生成厚度约(14±1) nm的片晶, 该片晶不易发生熔体等温增厚. 对实验数据分别用Avrami方程和Arrhenius方程进行了计算, Avrami指数 $n=3\pm 0.3$, 表明PLLA以球晶形式生长, 其最大结晶速率温度为(105.0±0.5) °C, $t_{1/2}$ 约为5.2 min. 利用Lauritzen-Hoffmann (LH) 理论对PLLA结晶机理进行了分析, 发现PLLA结晶的Regime II和Regime III的转变温度为107 °C. $K_g(\text{II})$ 和 $K_g(\text{III})$ 分别为 $4.57\times 10^5 \text{ K}^2$ 和 $1.115\times 10^6 \text{ K}^2$, 且 $K_g(\text{III})/K_g(\text{II})=2.4$, 与LH理论值一致.

关键词: 左旋聚乳酸; 熔体结晶; 结晶行为

Crystallization Behavior of Poly(L-lactide)

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Abstract:

Melt-crystallization behavior of poly(L-lactide) (PLLA) synthesized by Zn metal was investigated by using DSC, WAXD and POM. The crystallization behavior from the melt was investigated in the range from 368 to 398 K. The thicknesses of lamellae was (14±1) nm, and the thickening effect was not obvious. The results were treated with Avrami equation and Arrhenius equation. Avrami index n is 3 ± 0.3 which means that spherulites morphology of PLLA crystals formed in the temperature range; A maximum in the crystallization kinetics was observed around 378 K; half time of crystallization at 378 K was about 5.2 min. Lauritzen-Hoffmann(LH) theory was used to investigate the crystallization mechanism of PLLA, presenting the transition from regime II to regime III is approximately 380 K. The values of $K_g(\text{II})$ and $K_g(\text{III})$ were $4.57\times 10^5 \text{ K}^2$ or $1.115\times 10^6 \text{ K}^2$, respectively. And $K_g(\text{III})/K_g(\text{II})=2.44$, which accords with the value forecasted by LH theory.

Keywords: Poly(L-lactide); Melt crystallization; Crystallization behavior

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