

催化、动力学与反应器

外消旋乳酸直接聚合-二异氰酸酯溶液扩链反应机理

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摘要 以2,4-甲苯二异氰酸酯(TDI)为扩链剂,以外消旋乳酸(D,L-LA)直接熔融聚合合成的低分子量聚外消旋乳酸(PDLLA)为预聚体,在四氢呋喃(THF)溶液中进行扩链,使用不同的沉淀剂终止扩链反应,用黏均分子量、红外光谱(IR)、核磁共振氢谱(¹H NMR)、DSC等对扩链产物进行了表征和对比,探索外消旋乳酸直接熔融聚合-二异氰酸酯溶液扩链的反应机理。结果表明,二异氰酸酯溶液扩链中,前期的机理与二异氰酸酯熔融扩链类似,但溶液扩链结束时,使用不同的沉淀剂,有不同的终止机理:用甲醇沉淀时,残余NCO与甲醇OH反应,可保持原有聚合物结构基本不变;用水沉淀时,残余NCO与水反应较复杂,易引起交联产物形成。

关键词 [外消旋乳酸](#); [2,4-甲苯二异氰酸酯](#); [溶液扩链](#); [反应机理](#); [聚乳酸生物降解材料](#)

分类号

Reaction mechanism of diisocyanate solution chain extension on poly(D,L-lactic acid) produced by direct melt polycondensation

Abstract

Starting from cheaper D,L-lactic acid (D,L-LA), lower molecular weight poly(D,L-lactic acid) (PDLLA) was directly synthesized via melt polycondensation. By using PDLLA as prepolymer, 2,4-toluylene diisocyanate (TDI) as chain extender, and tetrahydrofuran (THF) as solvent, poly(D,L-lactic acid)s biodegradable material was synthesized through diisocyanate chain extension in solution state. When using different precipitators to terminate the solution chain extension, the solubility in chloroform, viscosity-average molecular weight (M_v), structure, and heat properties of chain extension products were different. Before precipitation, the reaction mechanism of chain extension in solution state was similar to that in the melt state. However, different precipitators had different termination mechanisms. When precipitated by methanol, the reaction between residual NCO group and OH group in methanol could keep the structure of product basically unchanged. When water was used instead of methanol, the complex reaction between residual NCO group and water was apt to produce cross-linking products.

Key words [D, L-lactic acid](#); [2,4-toluylene diisocyanate](#); [chain extension in solution state](#); [reaction mechanism](#); [poly\(lactic acid\)s biodegradable material](#)

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