

论文

聚3-羟基丁酸酯薄膜结晶的ATR-FTIR研究

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收稿日期 2004-8-19 修回日期 2004-10-8 网络版发布日期 接受日期

摘要 使用匀胶机 (spincoater), 通过溶液铸膜的方法, 在铝箔基板上制备出具有不同厚度的聚3-羟基丁酸酯 (PHB) 薄膜. 20℃ 室温条件下, 通过衰减全反射傅立叶红外光谱 (ATRFTIR) 原位观测了不同厚度薄膜的结晶过程, 并通过偏光ATRFTIR对薄膜中PHB分子的取向进行了研究. ATRFTIR原位观测结果显示, PHB在薄膜中的结晶速率以及结晶度均随着薄膜厚度的减小而逐渐降低; 同时, 偏光ATRFTIR测试结果表明, 随膜厚减小, 薄膜中结晶部分的PHB分子逐渐倾向于沿垂直于基板表面方向取向, 膜越薄, 倾向越明显. 可以认为, PHB分子与基板间的相互作用以及扩散控制结晶导致了上述现象的产生.

关键词 [PHB](#) [薄膜](#) [基板](#) [分子取向](#) [ATR-FTIR](#)

分类号

ATR-FTIR STUDIES ON THE EFFECT OF THICKNESS ON THE CRYSTALLIZATION OF POLY(3-HYDROXYBUTYRATE) THIN FILMS

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Abstract The crystallization of poly(3-hydroxybutyrate) (PHB) thin films was observed *in situ* by ATR (attenuated total reflection)-PTIR. The PHB films with different thickness were prepared by means of spin-coating on Al substrates, and then the isothermal crystallization of the PHB films at 200℃ was investigated *in situ* by ATR-FTIR. The results revealed that the crystallization kinetics of PHB films was affected obviously by the film thickness. A reduction in the crystallinity as well as in the rate of crystallization was found with decreasing the film thickness. because the crystallization occurred under constrained geometry conditions. In addition, the effect of film thickness on the orientation of the molecules of the PHB crystals in the films was investigated by polarized ATR-FTIR. The results imply a preferred orientation of the polymer chain axis in the crystals along the surface-normal direction of the flints. The thinner the film thickness, the more the preferred crystalline chain orientation perpendicular to the film surface is.

Key words [PHB](#) [Thin films](#) [Substrate](#) [Molecular orientation](#) [ATR-FTIR](#)

DOI:

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