

二苯酚 A/聚己內酯/聚乳酸酯三相混摻系統之相行為及相溶性探討

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摘要

不相溶的生物可分解高分子 poly(ϵ -caprolactone) (PCL)/poly(L-lactide) (PLLA)混摻，可藉由導入 bisphenol A (BPA) 使其相溶性增加而使得不相容的摻合體系轉而成為相溶的體系。根據微分掃描熱卡計(DSC)的分析發現 BPA/PCL 與 BPA/PLLA 兩相摻合系統在每一個比例組成單一玻璃轉移溫度(glass transition temperature)，指出 BPA 與 PCL、PLLA 互溶。而傅立葉紅外線光譜儀(FT-IR)印證在不同溫度及組成下 BPA 的 hydroxyl group 會與 PCL、PLLA 的 carbonyl group 產生分子間氫鍵。根據這些結果 BPA 能當作一相容劑加入 PCL/PLLA 兩相摻合系統中，使其相溶性增加而當足夠量的 BPA 加入下可以使原本在室溫下不相溶的 PCL/PLLA 摻合系統轉為相溶。偏光顯微鏡(POM)可用來研究在不同溫度下 BPA/PCL/PLLA 三相摻合系統的相行為，發現此系統為一個 upper critical solution temperature (UCST)的相圖，這是因為在高溫(200)時

K 的效應會比低溫時來的小，而變溫的傅立葉紅外線光譜測量更印證了此一結果。



**Effect of Bisphenol A on the Miscibility, Phase Morphology and Specific
Interaction in Immiscible Biodegradable
Poly(ϵ -caprolactone)/Poly(L-lactide) Blends**

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The logo of National Chiao Tung University is a circular emblem with a gear-like border. Inside the circle, there is a stylized building and the year '1896' at the bottom. The word 'Abstract' is written in bold black text across the center of the logo.

Abstract

Miscibility enhancement on the immiscible binary biodegradable blends of poly(ϵ -caprolactone) (PCL)/poly(L-lactide) (PLLA) with bisphenol A (BPA) is investigated in this study. The BPA is miscible with both PCL and PLLA since a single T_g over the entire composition range was observed based on differential scanning calorimetry (DSC) analyses. Fourier transform infrared spectroscopy (FTIR) is confirmed that the intermolecular hydrogen-bonding exists between the hydroxyl group of the BPA and the carbonyl group of the PCL and the PLLA at various compositions and temperatures. On the basis of these results, BPA was added as a compatibilizer to immiscible binary PCL/PLLA blend. The addition of BPA

is able to enhance the miscibility of the immiscible PCL/PLLA binary blend and transforms into miscible blend when a sufficiently quantity of the BPA is present at room temperature. In addition, optical microscopy (OM) measurements have been performed in order to study the phase morphologies of ternary BPA/PCL/PLLA blends with various temperatures, which indicate the upper critical solution temperature (UCST) phase diagram since the ΔK effect becomes smaller at higher temperature (200) than at room temperature. Infrared spectra measurements with various temperatures are able to provide good correlation with OM analysis.



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