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ORIGINAL PAPER

The Morphological properties of $SnCl_2{\cdot}2H_2O$-modified PC/PMMA blends

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Abstract $SnCl_2{\cdot}2H_2O$-modified PC/PMMA (80/20 w/w) blends were prepared by melt blending using a torque rheometer. The effect of $SnCl_2{\cdot}2H_2O$ content and blending conditions on the structures, phase morphologies and thermal properties of the blends were investigated by FTIR, SEM, TGA and DSC. The FTIR spectra of the 0.015 % (wt) $SnCl_2{\cdot}2H_2O$-modified PC/PMMA blends showed the characteristic peaks of both PC and PMMA due to the formation of PC-*g*-PMMA copolymers. From the SEM images, it was demonstrated that the domain size of the dispersed PMMA phase decreased clearly with the increases in $SnCl_2{\cdot}2H_2O$ content and the mixing time, but it increased with the incremental increases in the rotor rate before reaching 80 rpm. In addition, a similar co-continuous structure was observed in the two blend systems. The first blend was prepared at a temperature of 270 °C and a rotor rate of 40 rpm for 10 min, and the other blend was prepared at a temperature of 230 °C and a rotor rate of 70 rpm for 10 min. The TGA results showed that there was only one single-step thermal degradation in PC/PMMA blends which contained 0.100 % (wt) $SnCl_2{\cdot}2H_2O$, suggesting the formation of a homogeneous blend of the two phases. The DSC curves demonstrated that the 0.015 % (wt) $SnCl_2{\cdot}2H_2O$ modified the PC/PMMA blend systems which were prepared at 230, 240 or 250 °C and displayed only one single glass transition temperature (T_g). But, it showed two distinct T_gs when the mixing temperature was set at 260 and 270 °C.

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Introduction

Polymer blending has always been considered as an economical way to develop new polymeric materials whose physical properties may not only be superior to one of the component polymers but also tunable as a function of the blend composition [1–3]. The blends of PC and PMMA have been received considerable research attention [4–6] because of their potential applications as gas separation membranes, pearl materials, discs substrates in optical data storage medium, and packaging materials [7, 8].

Phase morphologies of PC/PMMA blend systems have been extensively investigated by various researchers [9–11], which depend on the methods of preparation. For example, Montaudo et al. [12] prepared a transparent homogeneous PC/PMMA blend containing 1 % (wt) of $SnO\text{-}Bu_2$ as ester-exchange catalyst, which was prepared by casting at 45 °C for 24 h and followed by further casting at 80 °C for 24 h using *o*-dichlorobenzene/chloroform (DCB/$CHCl_3$) (50/50 v/v) mixture as solvent. Kyu and Lim [13] prepared the PC/PMMA blends by solution casting. The thin films were obtained by casting the solution on glass slides at a low temperature of approximately 5 °C from tetrahydrofuran (THF). During the heating process of DSC, they observed an immiscibility loop in the PC/PMMA blends, where an upper critical solution temperature (UCST) curve was located above a lower critical solution temperature (LCST) curve. Besides, in their research the change of a single phase to a bi-phase and again to a single phase was studied. Suprakas et al. [14] studied the effect of organic modifier miscibility on the matrices, and the effect of the initial