

Optimization of Injection Molding Process for Fracture Toughness Specimen in Fiber Reinforced Polycarbonate Composites

短纖複合材料的破壞韌性試件於射出成形製程最佳化之研究

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Abstract

Injection molding is one of the most widely used processes in plastic manufacturing, yet the characteristics of its product are easily affected by the processing conditions such as filling time, melt temperature, mold temperature and ram speed. In this paper, an effective methodology for optimization injection molding process parameters in fiber reinforced polycarbonate composites is proposed. The method includes CAE flow simulation, experimental design of Taguchi and analysis of variance (ANOVA). Since our experimental specimen is a standard part for fracture toughness testing, it will be better when the fiber direction is parallel to the external load. So, to obtain the thickest core layer is our target. The results indicate that the most important control factor is only the filling time, the others can be neglected. That is completely different from the wear specimen at the same processing conditions in the previous study.

Keywords: optimization, polycarbonate, composites, injection molding, Taguchi method.

摘要

射出成形加工在塑膠加工業已被廣泛的使用，然而其產品特性很容易被製程條件像充填時間，融膠溫度，模具溫度和射出速度影響。

正因為如此，故本文中推薦一種新而有效益的方法，它結合了電腦輔助工程的模流分析，田口式的實驗設計分析法及統計學的變數分析。由於我們的實驗試件是標準的破壞韌性測試，故當纖維方向平行負載試件時，強度較佳。所以最厚的心型層是我們的品質目標。透過變異數分析，我們發現這些參數中，只需考慮充填時間，而其它的參數均可忽略，這與磨耗試件是迥然不同。