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材料科学与工程

注塑工艺参数对制品残余应力和收缩的影响

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摘要 注塑成型工艺参数对制品的最终残余应力和收缩有着直接的影响。基于线性黏弹性模型模拟计算了注塑成型过程中由温度和压力引起的残余应力和收缩。以无定型材料PS和ABS为例，系统地研究了不同成型工艺条件下平板制件的最终残余应力和收缩，并和实验结果进行对比验证。结果表明：在流动方向上无定型材料的收缩基本保持不变，残余应力沿壁厚分布的形状也基本相同，但流动末端处的应力值稍大于流动入口处；保压压力是影响制品收缩的关键因素，提高保压压力和注射温度可以降低制品的最终收缩，而模具温度对收缩的影响较小。

关键词 注塑成型 残余应力 收缩 工艺参数

分类号

Effect of processing conditions on residual stress and shrinkage in injection molding

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Abstract

In injection molding, the residual stress and shrinkage of the product are affected by processing conditions directly.A detailed linear thermoviscoelastic model was developed to calculate thermally and pressure induced residual stress and shrinkage in amorphous plastic parts.A systematic study on the effect of processing conditions on shrinkage and residual stress was made for PS and ABS.The results showed that the shrinkage for amorphous polymers was constant along the flow path, and the residual stress distribution through the thickness was almost the same in the flowpath, with a little higher stresses near the end.It indicated that the holding pressure was the key parameter, an increase in holding pressure and melt temperature caused a decrease in shrinkage and the effect of mold temperature on the shrinkage was much smaller.

Key words injection molding residual stress shrinkage processing condition

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