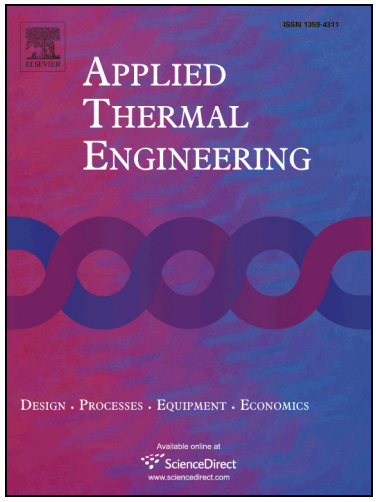

Research Paper

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Formation mechanism of porous structure in plastic parts injected by microcellular injection molding technology with variable mold temperature

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Abstract

Microcellular Injection Molding (MIM) process combined with rapid heat cycle molding (RHCM) technique can fabricate microcellular foamed plastic parts with excellent surface appearance. The porous structure influences the foamed parts' performances significantly and its evolution process is very complex in RHCM/MIM process. The temperature field and flow field play a very crucial role in determining the porous structure of the foamed parts. In this study, we developed a non-isothermal mathematical model based on the two-phase model to calculate the temperature field and flow field in RHCM/MIM process. Particularly, the coupling heat transfer between the injection mold and the polymer melt is considered by using the implicit domain coupled algorithm. By comparing with the experimental results, it is found that the developed model can predict the temperature field very accurately. The thermal response characteristics in RHCM/MIM process were further analyzed. By combining the simulation results with the cellular morphology obtained by experiments, we deeply analyzed the formation mechanisms of the cellular morphology in RHCM/MIM process.

Keywords: multiphase flow; rapid heat cycle molding; microcellular injection molding.

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