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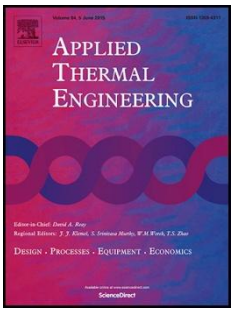

Title: Development and application of rapid thermal cycling molding with electric heating for improving surface quality of microcellular injection molded parts

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Development and application of rapid thermal cycling molding with electric heating for improving surface quality of microcellular injection molded parts

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Highlights

- RTCMIM with electric heating is developed to improve surface quality of molded part.
- Heat transfer in both mold heating and cooling stages is investigated.
- Experiments and simulations are conducted to evaluate mold thermal response.
- Effect of mold cavity surface temperature on part surface roughness is investigated.
- The effectiveness of developed RTCMIM technology is successfully demonstrated.

ABSTRACT

A rapid thermal cycling molding (RTCM) technology with electric heating and water cooling was developed to eliminate the surface defects of microcellular injection molded parts. To verify its effectiveness, an RTCM mold for producing microcellular cover plates was constructed. Experiments and simulations were conducted to evaluate the mold thermal response. The results show that the mold cavity surface temperature (T_M) can be rapidly adjusted in a large range. Moreover, empirical correlations for predicting the T_Ms were proposed and validated, and then can be used as an effective tool to accurately control the T_Ms in actual molding. Finally, microcellular polyformaldehyde (POM) cover plates were molded. The effect of the T_M on their surface roughness was investigated and relevant mechanism was analyzed. It is found that the part surface roughness can be effectively reduced by increasing the T_M. When raising the T_M close to or above 150 °C, the microcellular POM cover plates with glossy appearance comparable to the solid counterpart can be molded within an accepted molding cycle time,