Study of process parameters effect on the filling phase of micro injection moulding using weld lines as flow markers - DTU Orbit (04/06/2019)

Micro-injection moulding (micro-moulding) is a process which enables the mass production of polymer microproducts. In order to produce high-quality injection moulded micro-parts, a crucial aspect to be fully understood and optimised is the filling of the cavity by the molten polymer. As a result, the relationships between the filling pattern and the different process parameter settings have to be established. In this paper, a novel approach based on the use of weld lines as flow markers to trace the development of the flow front during the filling is proposed. The effects on the filling stage of process parameters such as temperature of the melt, temperature of the mould, injection speed and packing pressure have been investigated. An optical coordinate measuring machine has been employed for the investigation. The micro-cavity, which presents micro-features ranging from 600 μm down to 150 μm, has been manufactured by micro-electrodischarge machining. A commercially available polystyrene grade polymer has been moulded using a high-speed injection moulding machine. The design of experiment technique was employed to determine the effect of the process parameters on the filling phase of the micro-cavity. In addition, extensive measuring uncertainty analysis was performed to validate the experimental plan. Results show that the temperature of the mould and the injection speed are the most influencing process parameters during the injection moulding of a micro-component.

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