

Experimental and Numerical Study of Transcriptability of Micro Structured Surface in Injection Molding

Lee Jae Gu, Rha Moonwoo, Kang Tae Gon, Kwon Tai Hun

Experimental and numerical studies are carried out in order to investigate the transcriptability of the micro structures in injection molding. For this purpose, a mold insert is fabricated which has micro pole patterns. Mold insert has a ground plate of 1.5mm thickness, and have many micro poles over the ground plate. Height of the micro pole is varied from 10 μ m to 100 μ m, while keeping the aspect ratio as one. As the melt flows, melt inside the micro pole located near the gate starts to cool down. When the ground plate is totally filled, the melt front away from the gate is relatively hot. Thus melt inside the micro pole far from the gate is able to flow further. Consequently, the transcriptability of the micro pole is dependent on the relative position of micro pole to the gate. Numerical analysis system based on the domain decomposition method has been developed to verify micro structure filling phenomenon. Developed numerical system is composed of 2.5D program for ground plate and 3D program for micro structures. Further investigation about the effect of processing conditions, such as flow rate, mold wall temperature and melt temperature, on the transcriptability has been performed. The most dominant factors which affect the transcriptability of the micro pole are flow rate and mold wall temperature. High flow rate and high mold wall temperature enhance the transcriptability of pole structure. Numerical simulation also confirms that low flow rate causes a less filling of micro poles and high mold wall temperature helps the filling of the micro poles.