G09.16

Influence of pvT-Data Measured at High Cooling Rates on Injection Molding Simulation Results

*T. Lucyshyn (a), G. R. Langecker (a), I. Duretek (a), K. Fischer (b)

(a) *Institute of Plastics Processing, University of Leoben, Austria*
(b) *Polymer Competence Center Leoben GmbH, Leoben, Austria*

For the application of simulation programs for the injection molding process, apart from suitable physical models, exact material data are necessary in order to get reliable results, but the measuring conditions of existing standard measuring methods often do not correspond to the real process conditions. The influence of the cooling rate on the specific volume of thermoplastic polymers in dependence of pressure and temperature (pvT-diagrams) is well known from literature. Furthermore, a sensitivity analysis with the commercial simulation software Moldflow Plastics Insight (MPI) shows, that the warpage and shrinkage results are strongly influenced by minor variations of the pvT-data. Most of the available pvT-data are measured with a cooling rate of approx. 0.1 K/sec., which is significantly slower compared to the injection molding process. Therefore a new measuring apparatus for the determination of the specific volume at high cooling rates was developed at the Institute of Plastics Processing at Leoben/Austria. Contrary to the standard method, where a cylindrical specimen is cooled under pressure in order to measure the specific volume, the sample of the new measuring apparatus is a flat disc, where the heat can be carried off faster, comparable to an injection mold. The measuring cell is temperature controled with cooling circuits similar to an injection mold. The sample thickness can be varied in order to be able to investigate the influence of the part thickness on the shrinkage behavior. The general idea of this new apparatus is to provide pvT-data under measuring conditions very similar to the real conditions in the injection molding process (melt and mold temperature and part thickness are accounted for). In this paper the function of the new apparatus as well as measuring results compared to standard methods are presented. Furthermore, the influence on simulation results (especially warpage) with MPI will be demonstrated.