SL 7.18

# Optimisation of Micro Injection Moulding with Respect to Material Data under Process Conditions

*V. Hosdez (a), A. Kech (b), L. Meylheuc (a)*
*(a) Department of Mechanical Engineering, INSA Strasbourg, F-67084 Strasbourg, France*
*(b) Corporate Research and Development, Department Plastics, Robert Bosch GmbH, D-71301 Waiblingen, Germany*

Micro injection moulding allows the manufacturing of parts in the size of the micrometers in mass production. It was developed in the past ten years because of the generalized tendency in miniaturization in industry. Although it is based on the traditional process of standard injection moulding, a distinction needs to be done concerning the process conditions.
Unlike the hypothesis generally made for the simulation of injection moulded parts, micro parts have no flat and slim shape. It implies that the employed equation and calculation simplifications do not match anymore. The geometry must be translated as accurate as possible which requires a high mesh density to guarantee a good approximation of the reality, and the parameters normally neglected have to be taken into account.
Then, extreme process conditions imply changes in the characteristics of the melt. That is why a study of the rheological and thermal behaviour of the polymer during the filling stage of the micro cavity as been realised. In this work, a PA66 polymer was used. Material data was characterized close to process conditions at high shear rate and high cooling rates, respectively. We have established pvT-curves under a cooling rate higher than usually. Also measured viscosity data under high shear rate were used. By these means we aimed to obtain a databank more appropriate for the simulation. All of these experimental data were used as input in a three dimensional finite element analysis code, which considered a no flow criteria based on the transition temperature from DSC-measurements. Special attention has been paid to the heat transfer at the cavity mould interface and the transition temperature in order to predict the filling pattern accurately. Finally, good agreement for our injection moulded test part was shown between the numerical and experimental results.