Study of rheological behaviour of stainless steel feedstock taking into account the thermal effects

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ABSTRACT
Powder injection moulding (PIM) process is well established for production of small precision components with both metal and ceramic powders. In comparison to unfilled polymers, the PIM-feedstocks are highly filled multiphase systems, whose flow behaviour is very sensitive to composition of binder and powder loading. Furthermore, the rheology of highly filled multiphase systems is characterized by strain and temperature dependence and influenced by flow instabilities and yield stress. In this study, the rheological behaviour of 316L feedstocks with a polypropylene/wax binder system and different powder loadings was investigated. The experimental work was performed with a rotational and a high pressure capillary rheometer. The aim of this work was to evaluate mixing rules predicting the viscosity of the feedstock out of its composition taking into account the melt temperature rise due to dissipative heating. Hence, measured data were corrected with respect to temperature. Thus the influence of the temperature onto the viscosity and the related model was evaluated.

KEYWORDS rheology, powder injection moulding, highly filled polymer, heat dissipation, modelling