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Foam Injection-moulding of Polymer Components with a Significant Density Reduction

A. Mantey (a), J.K.W. Sandler (a), V. Altstädt (a) and D. Kunz (b)
(a) Department of Polymer Engineering, University of Bayreuth, D-95447 Bayreuth, Germany
(b) Neue Materialien Bayreuth GmbH, D-95448 Bayreuth, Germany

Foam injection-moulding of thin parts of about 3 mm thickness is commonly limited to a density reduction of about 15 %, due to the relatively instable operating and foaming conditions encountered during processing. However, components with a density reduction of more than 50% can be obtained using the breathing-mould technology. For example, after injection of the gas-laden polymer melt the clamping force is reduced to 1% and the sample is allowed to reach a maximum thickness or minimum density during the expansion process. More importantly, a significant weight reduction can also be achieved by exploiting the lower melt viscosity of a polymer-gas solution to inject the melt into a thin cavity and to allow foaming to a final part thickness of about 3 mm. However, the foaming behaviour of a given polymer-gas combination and the resulting cellular morphology critically depend on the melt elongational properties, especially under such extreme circumstances. The present article describes a series of experiments aimed at evaluating the approach of tailoring the melt elongational properties of linear semicrystalline polypropylene for the foam injection-moulding technology with either chemical or physical blowing agents by blending with a long chain-branched type or using a glass fibrereinforcement.