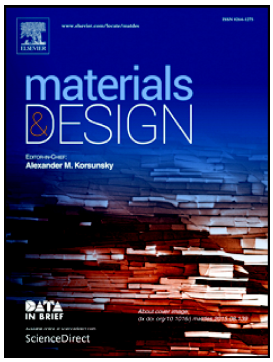

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Analysis of the shrinkage of injection-molded fiber-reinforced thin-wall parts

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ABSTRACT

Injection molding of thin-wall parts is characterized by a highly shear-stressed melt flow, which could affect the morphology of the moldings and consequently their shrinkage and warpage. This study focuses on the impact of injection molding processing conditions on dimensional accuracy of thin-wall fiber-reinforced parts. The reduction of shrinkage was taken in consideration by analyzing how the processing parameters affected the final dimensions of a 350 µm thick part. Moreover, the relation between the distribution of short glass fibers within the part and its dimensional accuracy was investigated by means of X-ray computed tomography. The experimental results showed that melt temperature and packing pressure were the processing parameters that most affected the shrinkage of thin-wall parts. In particular, a selection of high values for these parameters allowed for the minimization of the dimensional difference between the mold and the final parts. The analysis of the cross sections of the moldings allowed the observation of an almost flat trend of the orientation tensor for parts molded at lower injection speed, indicating the absence of the core layer. This caused a higher shrinkage along the cross-flow direction that eventually led to a differential shrinkage and to the warpage of the final part.

KEYWORDS: thin-wall injection molding, shrinkage, fiber orientation, computed tomography, skin-shear-core morphology

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