Rheology of high melt strength polypropylene for additive manufacturing

Rheological measurements of high melt strength polypropylene (HMS-PP) were used in order to generate master curves describing the shear-dependent viscosity in comparison to acrylonitrile butadiene styrene copolymer (ABS). The latter material showed specific disadvantages in terms of thermal stability, whereas HMS-PP showed a more stable behavior at the investigated temperatures. Hereafter, the material was used in a fused deposition modeling additive manufacturing process, focusing on the investigation of possible improvements of HMS-PP over ABS. Based on the extrusion parameters for ABS, adapted parameters for HMS-PP were determined using a fused deposition modeling test bench. The rheological survey clearly showed changes in the melt viscosity of both ABS and HMS-PP due to thermal degradation. However, the comparison of rheological data of the virgin materials with those of printed material showed negligible changes. This leads to the conclusion that the thermal degradation of HMS-PP and ABS during the fused deposition modeling process is negligible, due to the short exposure time to elevated temperatures. Copyright © 2017 VBRI Press.

General information
State: Published
Organisations: Department of Mechanical Engineering, Manufacturing Engineering, Vienna University of Technology
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Pages: 712-716
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Advanced Materials Letter
Volume: 8
Issue number: 6
ISSN (Print): 0976-3961
Ratings:
Scopus rating (2017): SJR 0.357 SNIP 0.93
Scopus rating (2016): SJR 0.411 SNIP 0.905
Scopus rating (2015): CiteScore 1.52 SJR 0.436 SNIP 0.893
Scopus rating (2014): CiteScore 1.79 SJR 0.582 SNIP 1.031
Scopus rating (2013): CiteScore 2.01 SJR 0.516 SNIP 1.28
Scopus rating (2012): CiteScore 1.37 SJR 0.38 SNIP 0.688
Scopus rating (2011): SJR 0.496 SNIP 1.509
Original language: English
Keywords: Additive manufacturing technology, ABS, Fused deposition modeling, HMS-PP, Rheology
Electronic versions:
jagenteufel2017rheology.pdf
DOIs:
10.5185/amlett.2017.1450
Research output: Research - peer-review › Journal article – Annual report year: 2017