Preparation and optimization of a titanium-based feedstock for Fused Deposition Modeling

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ABSTRACT

In this work the preparation and optimization of a titanium-based metal injection moulding (MIM) feedstock for Fused Deposition Modeling (FDM) is presented. The composition of the plastic binder system, consisting of a backbone polymer, a water-soluble polymer and a lubricant was optimized and MIM feedstocks with titanium contents ranging from 50 to 68 vol.% were prepared in a laboratory-scale internal mixer. During the feedstock preparation the torque of the mixing screws of the internal mixer was recorded, which allowed to determine an optimum Ti content of 59–61 vol.%. The morphology, thermal and rheological properties of the prepared MIM feedstocks were characterized using various techniques such as optical microscopy, SEM, FTIR, DSC, TGA, MFI and oscillatory rheometry. This study contributes to the emerging research on additive manufacturing of MIM feedstocks with the aim of producing pure titanium components with complicated shapes and high density from novel MIM feedstock as the starting material.