

Stainless steel parts produced by Fused Deposition Modeling with metal powder filled filaments and a debinding and sintering process

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Abstract.

Metal parts can be manufactured in the Fused Deposition Modeling (FDM) process using polymer filaments filled with metal powders. In accordance to the conventional MIM (Metal Injection Molding) process, the FDM process is used to produce green parts. The polymer is removed from these green parts in post-treatment steps to produce brown parts. Finally, the metal particles of the brown parts are sintered to produce the final components (white parts). During the sintering process, a shrinkage of about 20% occurs in each spatial direction. However, due to the green parts produced in FDM, the shrinkage is influenced by the part orientation on the building platform and the strand deposition strategy.

In this publication the BASF material Ultrafuse316L is investigated. This material is a POM (polyoxymethylene) polymer filled with stainless steel (316L) particles. The investigations focus on the influence of material specific FDM processing parameters and the achievable properties of the white parts. For this purpose, tensile strength tests are carried out. During the investigations, the properties of the green parts are considered in order to produce high-quality white parts. For example, the density of the green parts is used as an evaluation criterion to directly assess the part quality. Additionally, the possibility of producing partially filled component areas in FDM is being observed.