



Development of a process chain for the manufacturing of complex ceramic components by means of Fused Deposition Modelling

Jens Bliedtner

Ernst-Abbe-University of Applied Sciences Jena, Germany

Abstract:

The article introduces the additive manufacturing of components made of high-performance ceramics, especially of silicon carbide, silicon nitride, aluminium oxide and zirconium oxide. The entire process chain from material composition over filament manufacturing, 3D-print and further processing to the ready to use ceramics component was subject of the investigations. The work focussed on the development and processing of ceramics filaments. They can be processed on different 3D-print systems. This development was tested on an extruder system with an installation space volume of 200x200x250 mm³. The feedstock has to be suitable to be turned into a printable filament by means of a 1-screw extruder for which a sufficient flexibility for winding and a minimal tensile strength are necessary. The flexibility was characterised by a minimal bending radius at which the filament does not break yet. The material development included the harmonisation of the organic components in terms of composition and amount of the ceramic powder. Filaments with diameters of 1.75 and 2.85 mm were provided. A steady material discharge is necessary in order to process the two very different source materials (ceramics and plastic) by means of the FDM-procedure. This requires the homogeneous heating of the filament. The homogeneity directly affects the achievable component quality. Result is a material-adjusted viscosity-temperature controlled process for the processing of the ceramic filaments. First applications which were investigated and successfully realised with the new process chain are shown.

Biography:

Bliedtner, J. is Professor for Production Engineering and Production Automation at Ernst Abbe University of



Applied Sciences, Götze, K. is a scientific assistant and made her PHD in 2012 at Technical University Ilmenau, Ongom-Along, P. is a scientific assistant at Ernst Abbe University of Applied Sciences Jena.

Publication of speakers:

1. Jens Bliedtner et al; Analysis of Melt Pool Characteristics and Process Parameters Using a Coaxial Monitoring System during Directed Energy Deposition in Additive Manufacturing, 2019 Jan 19
2. Jens Bliedtner et al; Towards Automatically Controlled Dosing for Selective Laser Trabeculoplasty, 2019 Dec 2
3. Jens Bliedtner et al; Analysis of Melt Pool Characteristics and Process Parameters Using a Coaxial Monitoring System during Directed Energy Deposition in Additive Manufacturing, 2019 Jan 19
4. Jens Bliedtner et al; Arrival order and release from competition does not explain why haplochromine cichlids radiated in Lake Victoria, 2018 May 16
5. Jens Bliedtner et al; Mapping the Interactions between a RUN Domain from DENND5/Rab6IP1 and Sorting Nexin 1, 2012 Apr 25

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