



MATERIALS AND PROCESSES

MATERIAL JETTING – THERMOPLASTIC 3D PRINTING FOR MULTIMATERIAL PARTS

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Components that are, for instance, thermally or electrically equally insulating and conductive or multicolored place high demands on production. The additive manufacturing technology of Thermoplastic 3D Printing CerAM T3DP holds a great deal of potential when it comes to such multi material parts.

Technology

CerAM T3DP is based on a unique technology and plant development of IKTS, which overcomes the limits of conventional methods. The technology is based on the drop-by-drop deposition of particle-filled thermoplastic feedstocks. Defined overlapping of single droplets enables producing dense green components. A special feature is the solidification mechanism based on cooling. This is virtually independent of the physical properties of the materials used. It allows metals, hardmetals as well as oxide, nitride and carbide ceramic materials to be processed. The shaping is followed by debinding and sintering. The use of high-precision microdispensing systems (MDS) allows droplet volumes to be generated on a nanoliter scale. Depending on the dynamic viscosity of the used feedstock, the parameterization of the dosing cycle allows to realize droplet diameters between 300 and 1000 μm and layer heights between 100 and 200 μm .

Device development

The CerAM T3DP device developed at Fraunhofer IKTS has a 200 x 200 x 180 mm³ building platform that moves in x, y and z directions under up to four implemented MDS and a profile sensor. The maximum velocity of the building platform is

60 mm/s. The system is equipped with the latest hardware components, boasting a positioning accuracy of $\leq 20 \mu\text{m}$ and a repeatability of $\leq 5 \mu\text{m}$. After successful validation, the technology is to be commercialized based on this device.

Multifunctional components

Since up to four different feedstocks can be used, it is possible to realize material or property gradients, generating graded physical (mechanical, electrical, optical, thermal) and chemical properties.

Dosable materials

Al_2O_3 , ZrO_2 , TiO_2 , Si_3N_4 , AlN , WC , WC-Co (6–12 % Co), 17-4PH, 316L, sinter glasses, LTCC and functional materials

Services offered

- Feedstock and component development, as well as technology transfer
- Development of hard- and software for process monitoring and automation

- 1 CerAM T3DP production device.
- 2 Schematic representation of the MDS unit for monitoring.
- 3 Material deposition by fusion of individual droplets.
- 4 Functionalized sinter glass.