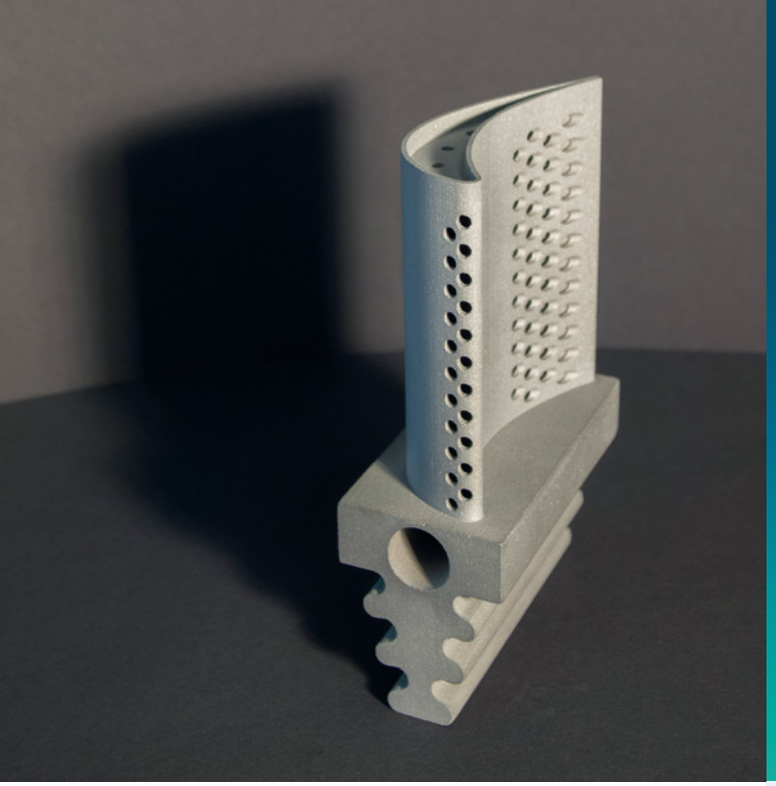

Service Offering

- **Identification** of a metal-ceramic material combination for a specific industrial application
- **Material** property optimisation via finite element methods
- **Powder** characterisation and optimisation (e.g. improvement of flowability)
- **Development** of inkjet binder systems
- **3D-printing** of metallic or ceramic preforms
- **Metal** melt infiltration of preforms
- **Sintering** in a controlled atmosphere
- **Optimisation** of heat treatments
- **Microstructure** characterisation
- **Non-destructive** testing of printed parts
- **Mechanical** testing

Fraunhofer-Center HTL
is certified acc. to ISO 9001:2015

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Center for High Temperature Materials and Design HTL

Additive Manufacturing of Components made of Metal-Ceramic Composites

Technical Data

- Type: M-Flex (ExOne)
- Laterale Resolution: 64 µm
- Layer Thickness: 50 - 200 µm
- Build Volume (X,Y,Z): 400 x 250 x 250 mm
- Building Speed: 3 - 12 mm per hour

Available Materials

Metals

- Diverse Steel Grades (opt. infiltration with bronze)
- Ni-Based Alloys
- Tungsten (opt. infiltration with Cu)

Ceramics

- Alumina (opt. infiltration with Al, Fe, Ti or Cu)
- Silicon Carbide (opt. infiltration with Si)
- Tungsten Carbide (opt. infiltration with Co or Ni)

Metal-Ceramic Composite Components

Additive Manufacturing

Fraunhofer-Center HTL develops cermet components for a range of industrial applications. Metal-ceramics composites are produced by using the entire powder metallurgy chain production:

- **Raw material processing**
- **Powder optimisation**
- **Forming**
- **Heat treatment**
- **Finishing**
- **Post-processing**

The focus lies on the additive manufacturing process with which customised components made of various materials are designed and manufactured.

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Binder Jetting Technology

In the binder jetting technology, components are printed layerwise by selectively jetting a liquid binder into a powder bed. The printed parts are then cured in the oven and freed from unbounded powder. The unbounded powder is recycled and can be reused in further printing.

The components following the printing and curing operations are porous. At a final heat treatment step, the components are debinded and densified by sintering or by metal melt infiltration.

By combining the powder bed method and an inkjet print-head utilising various binder liquids together with various infiltration materials, it is possible to additively manufacture complex prototypes and small batches in an enormous range of metal-ceramic material combinations.