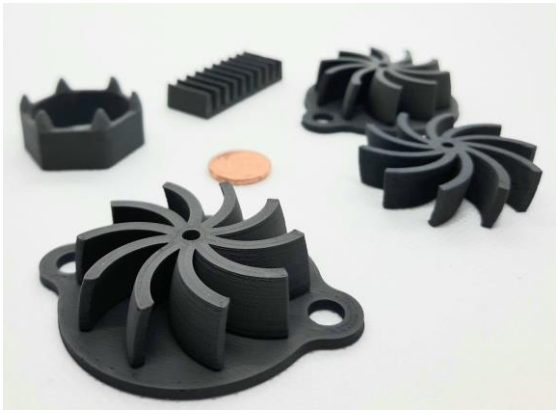
esa business incubation centre
Hessen & Baden Württemberg

M.A.T.

Additive Manufacturing of Metals and Ceramics



M.A.T. is an Additive Manufacturing (AM) solution for the production of complex geometries made out of metals and ceramics. With the M.A.T., 3DCERAM TIWARI utilizes the Fused Filament Fabrication (FFF) technique to produce ceramic and metallic parts with a 3D-printer working with special filaments. The 3D- printed parts are then eliminated of any non-metallic or non-ceramic component (binder) with the help of heat treatment at high temperatures, yielding pure and resistant parts suitable for all engineering applications in a matter of days. This cost-effective technique is suitable for a number of metals and ceramics, including metal-ceramic or ceramic-ceramic composites, and is capable of producing parts with high relative density.

Silicon Carbide Specifications:

- **Material: SSiC (Pure Silicon Carbide)**
- **Sintering type: Solid State Sintering**
- **Sintering Temperature: ca. 2100°C**
- **Bulk density (g/cc): 3.11**
- **Average Elastic Modulus (GPa): 248**
- **Average Flexural strength (MPa): 423**
- **Std. Deviation Flexural Strength (MPa): 67**
- **Samples tested for Flexural Strength (N): 14**
- **Type of Flexural testing: 3-Point Bending Test**
- **Thermal Conductivity at 20°C (W/m-K): 82**
- **CTE (ppm/°C): 2.9**
- **Temperature range for CTE (°C): [-130, +399]**
- **Diffusivity:**

Temperature [°C]	Diffusivity, [α,mm^2/s]
-99.7	73.859
-75.3	65.278
-50.6	57.079
-25.3	49.534
+23.6	39.24
+49.9	35.156
+100.7	28.842

All tests have been performed according relevant standards with calibrated test equipment at ESA's technology centre in the Netherlands (ESTEC).