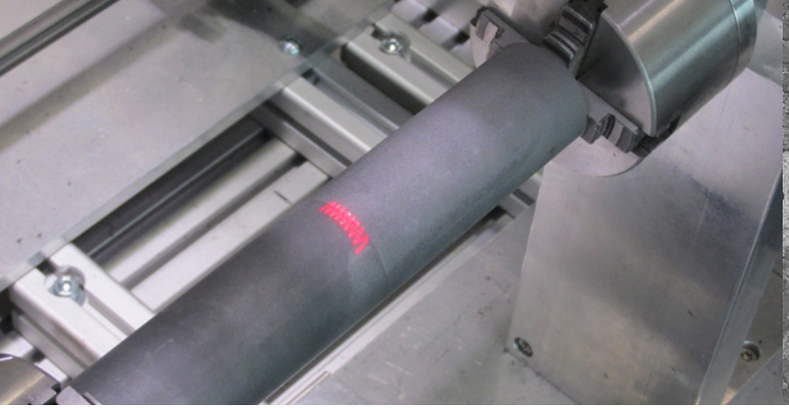

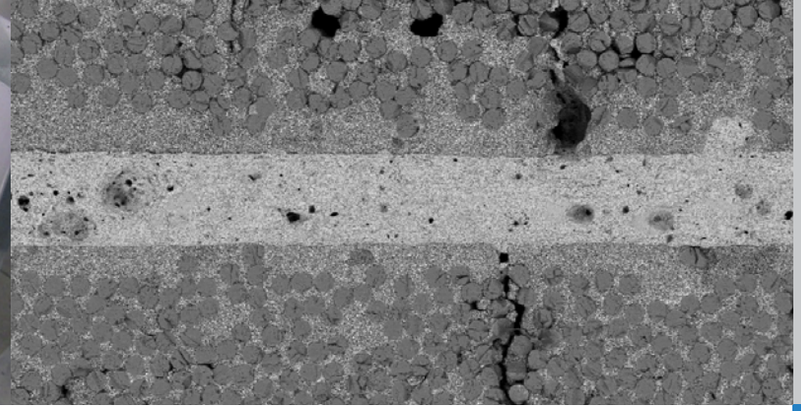

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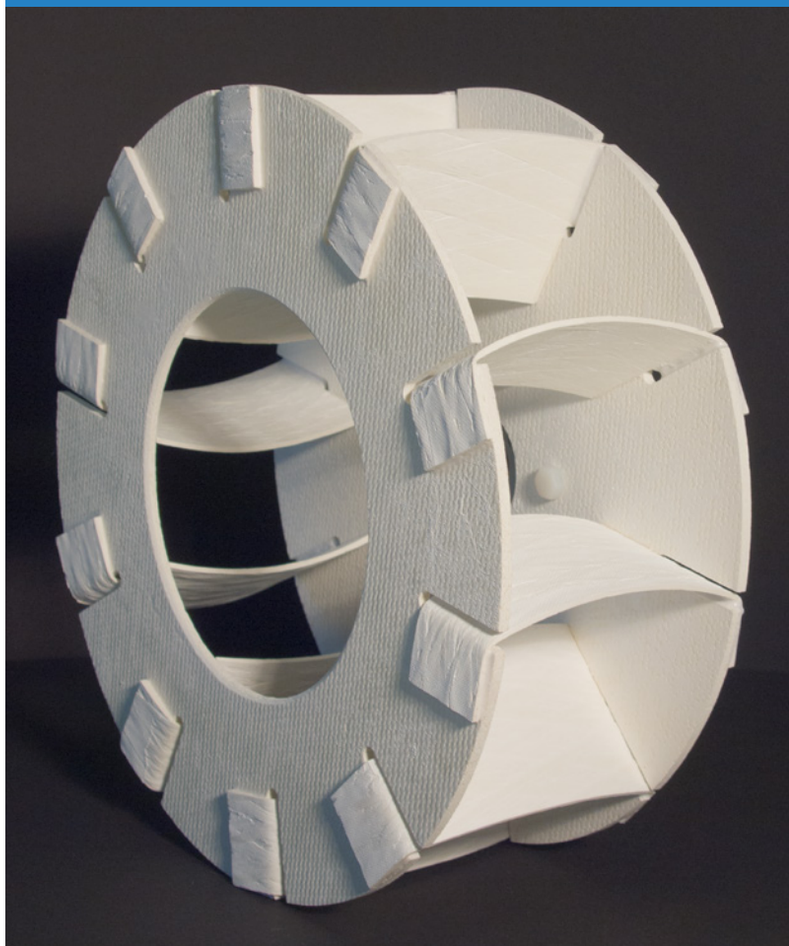
Joining Technique



Technical Data

Laser System

- CO_2 slab laser (P = 1.6 kW; 10.6 µm)
- Component size up to 400 x 600 x 500 mm
- 4 CNC axes and 2 axis high speed scanner system IntelliScan® 30 from SCANLAB
- Synchronous operating rotating equipment for component dimensions Ø 400 mm, L = 500 mm
- Variable atmosphere (N_2, Ar)
- Temperature control up to 2400°C

High-Temperature Furnace System

- Furnace systems for joining oxide and non-oxide ceramics and metallic materials
- Maximum joining temperatures approx. 2400°C
- Component size up to 800 x 800 x 600 mm
- Variable atmosphere (N_2, Ar, vacuum)
- Clamping device for joining of geometrically complex component geometries

Please feel free to contact us:

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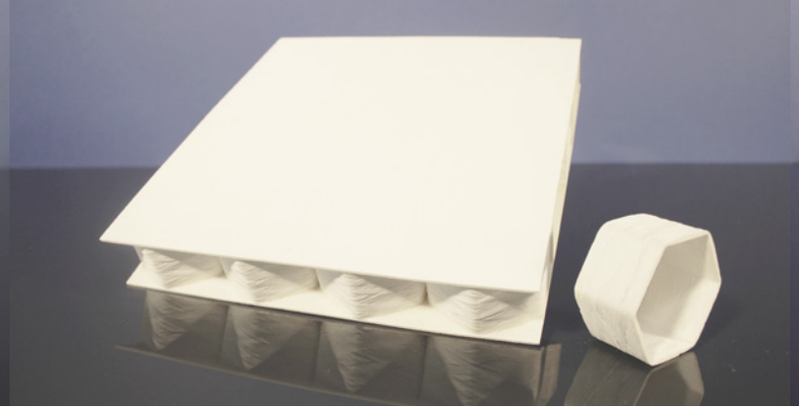
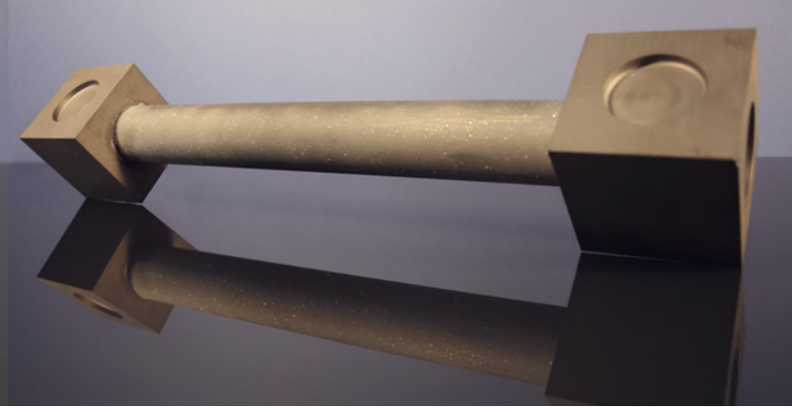
Fraunhofer-Center HTL
is certified according to ISO 9001:2015

Joining of Ceramics and Metals

Joining processes enable the manufacture of components with complex geometries from simpler standard components. They reduce the complexity and the costs of the manufacturing processes.

Furthermore, joining processes also play a significant role for joining partners made of different materials. Only by joining, composite components can be manufactured from these.

For high-temperature use of joint components, it is self-evident that the joint must also withstand high temperatures. Besides tensile and flexural strength, a high creep resistance and – in many cases – a high gas tightness of the joint is necessary. Sometimes, it is necessary to implement reversible joints. The joint partners for high-temperature applications are always ceramics or metals.

Fraunhofer-Center HTL develops joining methods for brazing, positive-locking and/or force-locking connections of complex components or material composites made of ceramic, fiber-reinforced ceramics (CMC) and metals.

Methods

Fraunhofer-Center HTL develops high-temperature resistant solders, which are adapted exactly to the material to be joined and the application requirements. Using finite element (FE) procedures, constructions suitable for joining are determined. The joined surfaces, including component overlaps or interlocking are manufactured in the required surface quality and applied with solder.

With the laser heating, joining partners can be joined to a complex component in a matter of minutes. The thermal management is clarified beforehand with computer simulations to establish a fast and stress-free joining process.

As an alternative, furnace systems for heating the joining systems are used. Batch process in large furnaces allow higher part volume turnovers with adjustable gas atmospheres.

The evaluation of the manufactured joining connections occurs, e.g., by computer tomography, mechanical testing and testing of the gas tightness – if required even at high temperatures.

Our Services

Fraunhofer-Center HTL develops joining methods for ceramic components as well as for metal-ceramic composites. In cooperation with the customer, the joining process as well as the subsequent characterization are determined.

The following services are available:

- Feasibility studies
- Joining-suitable design due to FE simulation
- Development of solder systems for joining ceramic materials and material composites
- Tempering of joining surfaces
- Manufacture of special joining jigs
- Joining tests using lasers or furnace technology
- Manufacture of prototypes and small lots
- Characterization of joinings
  - Grinding pattern analysis
  - Mechanical test with room temperature and high temperature up to 1500°C
  - Computer tomography, thermography, ultrasonic testing and terahertz wave analysis
  - Gas tightness test > 1000°C according to DIN EN 1779