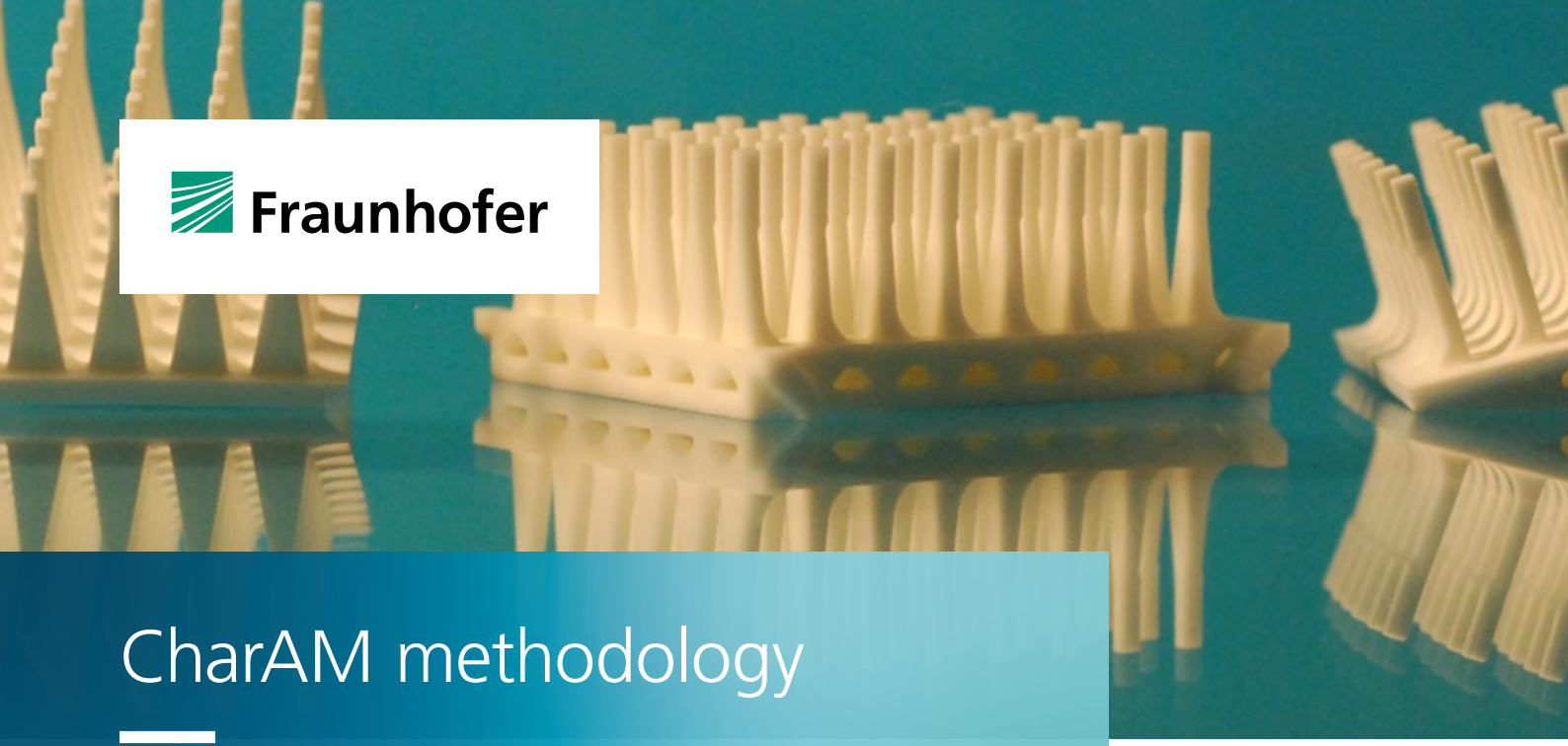

CharAM methodology

Statistically validated mechanical and geometric characterization of ceramic AM components as a function of orientation and surface topography

The CharAM methodology enables statistically reliable mechanical and geometric characterization of additively manufactured components with a very high stiffness, such as high-performance ceramic components, as a function of the alignment of the components during the manufacturing process and the resulting surface topography.

High-performance ceramics have outstanding thermal, chemical, and mechanical properties and are superior to metallic and polymer materials in many applications.
However, these materials break brittle, and the surface topography has a significant influence on their mechanical behavior. Staircase-like topographies and corresponding notches are not uncommon, especially in AM components.

In order to meet the requirements for taking these topographies into account in the mechanical characterization of components, the CharAM methodology was developed at Fraunhofer IKTS and established with various industry and research partners in Germany and Austria.
The CharAM methodology is based on a novel test specimen design. The basic elements of the test specimen are a base plate and 48 prismatic test specimens (pins) that are aligned perpendicular to the top of the base plate.

Due to the special design of the pins (increasing cross-section), the bending moment, which increases with the distance from the force application point, is compensated by the increasing moment of resistance, so that a range with a constant maximum bending stress is present during the test.

Below the base plate is a support structure that eliminates influences during the processing of the test specimens and allows the entire base plate with the pins to be tilted in the installation space, creating the typical topologies in the test area and making them effective during the test.

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exhibit overview