Figure 1: Scanned surface of a printed specimen
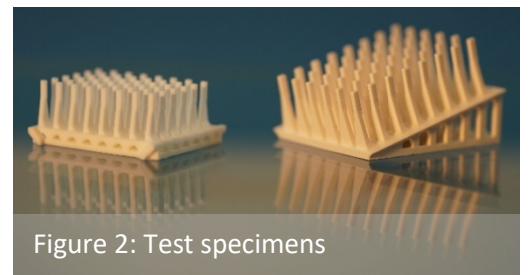
Figure 2: Test specimens

Master's Thesis in the framework of FFG-Project "CharAM"

Department Materials Science / Lehrstuhl fuer Struktur- und Funktionskeramik

„Development of a testing fixture and characterisation of 3D-printed specimens "

3D-printed specimens often exhibit a multitude of textured surfaces as a consequence of the additive manufacturing process. For the stereolithographic printing process, the texture's geometry and periodicity depend on the printing direction, e.g. the angle between the building direction and the specimen surface. Within the project "CharAM", novel test specimens have been developed to assess the influence of the printing orientation on the measured strength. The focus of this work will be the development of a testing fixture to determine the mechanical strength of these test specimens. Additionally, the effects of textured surfaces on the measured strength will be assessed by utilizing the aforementioned as well as standardized testing methods.

Figure 3: Stereolithographic 3D-Printer

Main tasks:

- Literature research on strength testing, the influence of surface structures and 3D-printing of ceramic materials
- Development and modification of a testing fixture for the novel specimens shown in Figure 2 for a universal testing machine
- Fabrication of specimens with varying printing orientations with a stereolithographic 3D-printer by LITHOZ
- Strength measurement of these specimens with the engineered testing fixture
- Validation of these results by fabrication and characterisation of reference-specimens with proven testing methods (Ball-on-Three-Balls-Test, 4-Point-Bending, Ring-on-Ring-Test)
- Statistic evaluation of all results and determination of the influence of printing orientations on the measured strength

Beyond that, a publication in a peer-reviewed journal is planned.

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Start: from September 1st, 2021, or as soon as possible

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