

Mechanical characterization and fractography of ceramics produced by additive manufacturing

Additive manufacturing (AM) techniques increasingly become a relevant fabrication method in the field of high-performance ceramics. The increasing importance of these components also requires the availability of testing procedures that ensure the quality and homogeneity of parts made by AM.

A specific aspect of the strength of additive manufactured components and specimens is the building direction. The interface between adjacent layers may have properties that deviate from the properties of the layers themselves. In a bending bar as usually used for strength testing of ceramics the layers may be oriented parallel to each of the specimens faces. During flexural strength testing the applied stress then acts normal or parallel to the interfaces. This enables an investigation of properties in relation to the building direction.

In this contribution we present mechanical properties obtained on specimens from additive manufactured alumina components. Specimens tested in different orientations with respect to the building direction are investigated. The relation between applied stress direction, strength and building direction is presented. It is shown that proper choice of the materials as well as the printing and post-processing parameters are extremely important to realize a homogeneous and isotropic microstructure and thus, ceramic components with isotropic material properties.