

ADDITIVE MANUFACTURING OF HIGH-PERFORMANCE CERAMICS



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While Additive Manufacturing (AM)-technologies are already state-of-the-art in plastics processing or metalworking, the ceramic industry has been reluctant to implement this kind of technology due to insufficient quality of the parts produced by this method. Additive manufactured ceramics used to lack essential material properties such as density or strength, which hindered the application of such parts as technical ceramics.

The Lithography-based Ceramic Manufacturing (LCM) process is an additive manufacturing (AM) technique is based on the principle of photopolymerization and is especially designed for the fabrication of precise and strong ceramic objects. The layer-by-layer building principle enables the direct production of the 3D objects from the respective CAD data.

This technique uses the selective curing of a photosensitive ceramic suspension by a mask exposure process. During the structuring, a photopolymer matrix is generated, which temporarily acts as scaffold and binder for the ceramic particles and is later on removed at elevated temperatures. Due to this approach, this novel technique achieves high grain densities and thus, enables the production of strong, dense and accurate ceramic parts without any geometrical limitations. The parts produced using this technology have the same or very similar properties as classical formed ceramic parts and are of competitive strength and quality as these conventional fabrication techniques which demonstrates the possibility to use photopolymerization as a means to structure high-performance materials beyond polymers.

Dr. Johannes Homa received his master in industrial engineering at the Vienna University of Technology in 2005 and finished his PhD. at the same university in 2008. He is teaching since 2009 at different universities and is co-inventor of three patents. Dr. Homa is the Co-founder and CEO of Lithoz GmbH. Lithoz GmbH is based in Vienna/Austria and is the world leader in additive manufacturing of ceramic components.