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Opportunities and Potentials of Lithography-based Metal Manufacturing [LMM] for the Production of Miniaturized and Complex Metal Components

Lithography-based Metal Manufacturing (LMM) is a promising additive manufacturing (AM) technology designed for the production of complex, miniaturised metal parts with high precision and surface quality. The presentation will provide an introduction to the fundamental principles of the LMM process and explain the process chain. This process chain commences with the formulation of the feedstock and continues through photopolymer-based printing, debinding and sintering.

LMM is distinguished from other metal AM technologies by its ability to produce fine structures, intricate internal geometries, and high-resolution surface features with excellent repeatability. These characteristics render it highly suitable for utilisation in medical devices, micro-mechanics, and engineering, where miniaturization and accuracy are paramount. The integration of a high-resolution printing technique with scalable thermal post-processing methodologies has emerged as a novel approach within the field of metal manufacturing. This integration presents novel opportunities for the design and fabrication of advanced metal components, particularly in scenarios where conventional manufacturing methodologies encounter limitations.

Beyond providing an explanation of the fundamental process steps, the talk will offer insight into current material development efforts, with a particular focus on shape memory alloys. A particular focus will be placed on the challenges and opportunities inherent to the processing of nickel-titanium. The results of the research and development work carried out by MetShape demonstrate how the LMM process can be adapted in order to produce NiTi parts that maintain their functionality.