

Multi-Material processing in Additive Manufacturing

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Among other things, Additive Manufacturing processes like Laser-Metal-Deposition (LMD) allow the near-net-shape construction of complex 3D-components, the possibility of functional integration, production lead time reduction as well as the processing of materials which are difficult to handle conventionally. In addition to these advantages, application fields can be extended by systematic processing and tailored combinations of multiple materials with different beneficial properties on one component.

Comparable to naturally grown structures, different multi-material combinations can be produced. In these terms, for instance (i) sharp (discontinuous) and (ii) graded (continuous) material transitions can be manufactured by LMD. Furthermore, the deposition of (iii) composite structures consisting of filler particles in a matrix and the production of (iv) in-situ alloyed layers is feasible. Phenomena such as segregation, varying absorption degrees or thermal stresses, which present a challenge in LMD multi-material processing, result in the requirement for material specific process modifications.

In this lecture, process- and material-related challenges as well as developed solutions for successful LMD multi-material processing are presented and discussed using selected industry-relevant examples.