

## Simulation based process development for powder bed AM technologies

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The physical processes in powder-bed-based additive manufacturing are, on the one hand, very complex and, on the other hand, very difficult to observe. Numerical simulation is therefore an important tool for process development in additive manufacturing and helps to better understand the basic mechanisms.

As part of this lecture, a software package (SAMPLE) developed at the WTM Chair will be presented to simulate material consolidation and structure in the beam based additive production of high-performance materials.

SAMPLE is able to reflect the influence of powder size distribution and bulk density on consolidation, the emergence of typical consolidation errors and surface roughness. Evaporation of volatile elements, such as aluminum, can be taken into account. Special effects, which occur, for example for powder mixings, can also be mapped. The resulting grain structure and texture can be set specifically depending on the melting strategy applied.

The numerical results are verified using experimental data and the predictive power of the simulation is demonstrated.