

## Modelling, and validation of Selective Laser sintering of PA12

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### Abstract:

One of the larger growing fields within additive manufacturing is the selective laser sintering process of semi-crystalline polymer powders. The powder particles are sintered together in local areas due the energy coming from a laser. This method allows for rapid manufacturing of complex parts, which are well suited for prototyping. The overall accuracy and stability of the process, along with part properties, are highly dependent on the involved process parameters. A better control of these parameters, will therefore lead to further optimization of the process. The current paper proposes a numerical modelling approach, for understanding the impact of major input parameters on the meso-scale thermal conditions, during the process. The model makes it possible, to analyze the influence of the laser-related input parameters, in relation to the temperature distribution and size of melt pool geometry, during the process. For validation, the predicted melt pool geometry is compared with the single-line track data found experimentally, where the melt pool geometry, can be compared to the numerical measurements by light optical microscopy and an in-situ infrared camera. Furthermore, an adaptive mesh refinement technique is developed and integrated in the model, which allows for modelling the thermal conditions of real-size parts within an acceptable computational time with a good agreement with experimental observations. The numerical approach is utilized through both custom code in Matlab, and by the commercial available software package COMSOL Multiphysics.

### REFERENCES

- [1] Modelling, simulation and experimental validation of heat transfer in selective laser melting of the polymeric material PA12. D. Riedlbauer a , M. Drexler b , D. Drummer b , P. Steinmann a , J. Mergheim a,†