Towards industrialized modelling a of powder bed additive manufacturing: Integration of multiscale effects into complete workpiece analysis

A. Katharina Eissing[†,*], Darya Kastsian[†], Frank Heinrichsdorff[†] and Daniel Reznik[†]

[†] Siemens AG, Corporate Technology
Siemensdamm 50, D-13629 Berlin, Germany
e-mail: katharina.eissing@siemens.com - web page: www.siemens.com/ingenuityforlife

ABSTRACT

Powder bed additive manufacturing promises both highest material quality as well as high degrees of freedom in parts designing. In order to move from a pure prototyping platform towards industrialized production of parts, process modelling is needed to raise the level of process stability and enable first-time-right manufacturing.

It is well-known that numerical simulation of AM techniques is hampered by the multi-physics and multi-scale nature of the process, forcing the introduction of distinct models for local-scale and workpiece-scale effects.

In this talk, we will present best-practice approaches, as they are successfully implemented in industrial process simulation software. Moreover, we present an innovative approach to couple the local and the workpiece-scale and calculate the thermal transients of any exposed point in each layer of a part to be printed, based on a unique machine-learning ansatz.

On the basis of the resulting thermal transients we evaluate a whole workpiece for critical regions concerning overheating. This allows to define improved toolpaths in the next step.