

Developments in Computational Welding Mechanics for Additive Manufacturing

Lars-Erik Lindgren

Department of Mathematics and Engineering Sciences
Luleå University of Technology
Lars-Erik.Lindgren@ltu.se

Approaches developed within computational welding mechanics (CWM) are readily transferable to Direct Energy Deposit (DED) methods [1, 2] whereas Powder Bed Fusion (PBF) processes bring additional challenges to the modelling and simulation, particularly due to the larger amount of thin layers in the process. CWM models focus on the overall behaviour of the component. They usually ignore whatever happens before the weld starts to solidify and thus limits the range of phenomena they can describe. The talk covers the current state of art with particular focus on material modelling in presence of microstructural changes. It will also touch upon techniques for efficient simulations, as more details given in other presentations at the conference. The talk will also describe the current lines of developments towards estimation of defects due to hot cracking for Inconel 718 as well as future work on pore generation in weld zone of Ti 6Al-4V. The latter requires information about the weld pool behaviour bringing additional challenges.

References

- [1] Andreas Lundbäck and Lars-Erik Lindgren. Modelling of metal deposition. *Finite Elements in Analysis and Design*, 47(10):1169–1177, October 2011.
- [2] M. Fisk and A. Lundbck. Simulation and validation of repair welding and heat treatment of an alloy 718 plate. *Finite Elements in Analysis and Design*, 58:66 – 73, 2012.