14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19- 24, 2020, Paris, France

COMPUTATIONAL MODELING OF PROCESS, STRUCTURE, PROPERTY IN ADDITIVE MANUFACTURING

TRACK NUMBER (1000)

WENTAO YAN[*], JINHUI YAN[†], ZELIANG LIU[^], AND WING KAM LIU[$]

[*] National University of Singapore
9 Engineering Drive 1, Singapore
mpeyanw@nus.edu.sg

[†] University of Illinois Urbana-Champaign
Newmark 2106, 205 N. Mathews, Urbana, IL, USA
yjh@illinois.edu

[^] Livermore Software Technology Corporation
7374 Las Positas Road, Livermore, CA, USA
zlliu@lstc.com

[$] Northwestern University
2145 Sheridan Rd., Evanston, IL, USA
w-liu@northwestern.edu

Key words: Instructions, Minisymposium, Computational Mechanics, Fluid Dynamics.

ABSTRACT

Metal Additive Manufacturing (AM) technologies (typically Selective Laser/Electron Beam Melting/Sintering and Direct Energy Deposition) are revolutionizing industries. However, the wide industrial adoption is hindered by the lack of fundamental understanding of the complex manufacturing process, material structure and mechanical properties. One goal of modeling for AM is to predict the resultant mechanical properties from given manufacturing parameters and intrinsic material properties, thereby reducing uncertainty in the material built. This can dramatically reduce the time and cost for the R&D of new products using AM. Thus, this mini-symposium is aimed at providing a platform to discuss computational models for AM process, structure and property to advance the fundamental understanding, and to further facilitate industry deveopment. Specific topics of the mini-symposium include (but are not limited to)

- Multi-physics modeling of AM processes, including powder melting/sintering, powder spreading/feed, physically-informed heat source modeling, and thermal stress and distortion
- Modeling of micro-structure evolution, such as grain growth/coarsening, solid-state phase transformation Mechanical modeling incorporating micro-structures (such as crystal, pores and voids) to predict mechanical properties

- High-fidelity and reduced-order computational methods for process, structure and property predictions, such as multi-phase flow, free surface capturing, granular flow, phase field, Cellular Automata, Monte Carlo, and Meshfree methods
- Data-driven surrogate modelling (meta-modeling), incorporating machine learning algorithms
- Topology optimization and multi-objective optimization
- Uncertainty quantification
- Experimental validation of models