

INVITATION FOR BOOK CHAPTERS

Quality Analysis of Additively Manufactured Metals



Editor(s)

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Rationale:

Quality optimization and improvement in additively manufactured (AM) metal products is a critical issue in a wide-range of industries. To obtain high-quality AM products for assembly in different industrial applications, their mechanical characteristics under different loading conditions are a critical issue. Empirical process parameters and post-processing approaches need to be taken into account in order to obtain the desired mechanical functions. Numerical simulation approaches provide valuable insight into the design of processing plans and also enable optimal post-processing conditions. Simulation method at different scales are used for the AM processes and optimization of product properties, and the relationship between process, microstructure, and property must be identified to develop these models. Hence the book will pay particular attention to the inherent properties of the metallic materials in the context of AM processing methods.

The proposed book aims to provide a thorough overview of the fundamentals, methods, and processing of metallic AM part quality assurance and enhancement. Readers will come away with a deeper understanding of how to use simulation tools to optimize AM metal quality, and the lessons in the book will be built upon a combination of experimental data and simulation results. It will provide case studies emphasizing the challenges and applied solutions for each topic. We see the book being a valuable reference for upper level undergraduate and graduate students in a variety of engineering disciplines, and given the focus on microstructural features in AM metals and their effects on mechanical properties, we feel the book will also have an audience in various industrial fields. It will also benefit researchers involved in material and processing parameter design.

The book will be structured based on the following table of contents:

Section I: Fundamentals

- *Chapter 1-1: AM processes for metals*
- *Chapter 1-2: Microstructural features in metallic parts made by AM*
- *Chapter 1-3: Quality of AM metal and methods of quality improvement*
- *Chapter 1-4: Computational micromechanics and multi-scale investigation for metallic materials*
- *Chapter 1-5: Process – Microstructure – Property relation for AM metals and the effect of thermal properties*
- *Chapter 1-6: Standards for AM metal quality and QC procedure*

Section II: Process, Microstructure, Property for Metals: Experimental Investigations

- *Chapter 2-1: Laser beam powder bed fusion*
- *Chapter 2-2: Electron beam powder bed fusion*
- *Chapter 2-3: Direct energy deposition method*
- *Chapter 2-4: Material extrusion sintering process*
- *Chapter 2-5: Binder jet process*
- *Chapter 2-6: Post-processing methods for metal AM and dealing with residual stresses*

Section III: Improvement/Optimization of AM Part Quality by Predictive Simulation Methods

- *Chapter 3-1: Predictive simulation of microstructural pattern in AM for metals in powder bed fusion*
- *Chapter 3-2: Micro damage and micro failure investigation of AM Metals*
- *Chapter 3-3: Micro mechanical property analysis of AM part by simulation tools*
- *Chapter 3-4: Simulation-assisted design for additive manufacturing: computational optimization for multi objective design*
- *Chapter 3-5: Residual stress analysis and geometrical tolerances in powder bed fusion and direct energy deposition process*

Section IV: Future Perspectives and Applications of AM Industrial Products

- *Chapter 4-1: Quality of AM parts in automotive application: design- process- property relation for automotive parts*
- *Chapter 4-2: Quality of AM implants in biomedical application*
- *Chapter 4-3: Quality of AM parts in aerospace applications*

Are you interested? Do you have some ideas to present?

- If you think your research activity fits any of the chapter's topics, please let us know your ideas to contribute.
- If you have some idea about a topic which is not included in the chapter list, please do not hesitate to inform us. The chapter topics are not restricted to the above list, and authors could choose on other probable fields of AM metals according to their preferences.
- Please inform us if you are aware of other colleagues who are working on AM metals, and you may think they can help us develop the chapters.

SCHEDULE

(Tentative)

Deadline to accept invitation:	1 st Feb 2021
Abstract submission:	4 th March 2021
First draft submission:	2 nd October 2021
Final draft submission:	1 st December 2021
Expected publication:	January 2022

Please inform us if you are desired to take part in this project. All submissions and questions should be directed to "<mailto:Javad.Kadkhodapour@imwf.uni-stuttgart.de>".