

# **44th Riso International Symposium on Materials Science (RISO 2024)**

IOP Conference Series: Materials Science and Engineering  
Volume 1310

Roskilde, Denmark  
2-6 September 2024

ISBN: 979-8-3313-0267-2  
ISSN: 1757-8981

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571

**Some format issues inherent in the e-media version may also appear in this print version.**

This work is licensed under a Creative Commons Attribution 3.0 International Licence.  
Licence details: <http://creativecommons.org/licenses/by/3.0/>.

No changes have been made to the content of these proceedings. There may be changes to pagination and minor adjustments for aesthetics.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact the Institute of Physics  
at the address below.

Institute of Physics  
Dirac House, Temple Back  
Bristol BS1 6BE UK

Phone: 44 1 17 929 7481  
Fax: 44 1 17 920 0979

[techtracking@iop.org](mailto:techtracking@iop.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

Preface	
Peer Review Statement	
In-Situ EBSD Study of Austenitisation in a Wire-Arc Additively Manufactured High-Strength Steel .....	1
<i>M Taylor, Y H Mozumder, A D Smith, A E Davis, F Scenini, P B Prangnell, E J Pickering</i>	
Additive Manufacturing to Design a New Material TiB <sub>2</sub> -Reinforced SUS316L Using TiB <sub>2</sub> -Fe Composite Powder .....	9
<i>R. Otsuka, T. Kikuchi, T. Yamamoto, S. Katayama</i>	
Characterisation of T1 (Al <sub>2</sub> CuLi) Precipitates in Conventional (2099-T83) and Laser Additive Manufactured (PBF-LB/M, DED-LB/M) Microstructures.....	17
<i>F Adjei-Kyeremeh, C K Akuata, N Bansal, S Zischke, I Raffeis, A B Polaczek</i>	
Microstructure of Additive Manufactured Materials for Plasma-Facing Components of Future Fusion Reactors .....	25
<i>D A H Wartacz, H Becker, S Antusch, N Ordás, C Gundlach, O V Mishin, W Pantleon</i>	
Large-Scale Microstructure Modelling of an Additively Manufactured Part Using Cellular Automata .....	33
<i>O Zinovieva, A Zinoviev, O Gokcekaya, Y Tang</i>	
Understanding Heterogeneous Nucleation and Predicting Grain Size in Wire and Arc Additive Manufacturing of Steels with Inoculation .....	41
<i>Y Xu, G. Tranell, Y Li</i>	
Influence of Print-Chamber Oxygen Content on the Microstructure and Properties of 3D-Printed 316L .....	49
<i>Wy Wang, W Liu, A Godfrey</i>	
Optical Microscopy on Machined Surfaces in Ti-6Al-4V Reveals Pore Statistics that Correlate with Fatigue.....	57
<i>J Choi, K Zhou, E Adcock, J Pauza, A Ngo, T Swierzewski, J Lewandowski, A D Rollett</i>	
The Metallurgy of Additive Manufacturing: Potentials and Challenges Towards Industrialisation .....	79
<i>P Mayr, S Rauh, G Matheson, S Rotzsche, S Hartmann, E Kablman</i>	
Assessing and Controlling Microstructure Heterogeneity in Fusion-Based Additive Manufacturing.....	99
<i>M Seita</i>	
Building Microstructures by Welding Millions of Little Bits of Metal Together: Measurement Approaches, Model Validation, and Post-Build Processing .....	109
<i>L E Levine, E J Schwalbach, F Zhang</i>	
Dislocation Structure Evolution During Metal Additive Manufacturing.....	118
<i>M V Upadhyay, S Gaudez, W Pantleon</i>	
Control of Crystallographic Textures by Metal Additive manufacturing-A Review .....	133
<i>Takayoshi Nakano</i>	
Microstructure Evolution in Laser-Based Powder Bed Fusion of Metals .....	147
<i>Venkata K Nadimpalli, Tianbo Yu</i>	

An Image-Driven Machine Learning Method for Microstructure Characterization in Metal Additive Manufacturing: Generative Adversarial Network.....	161
<i>Z Cao, Y Liu, J J Kruzic, X Li</i>	
Inhomogeneous Deformation in Melt-Pool Structure of Al-Fe-Cu Alloy Manufactured by Laser Powder Bed Fusion .....	167
<i>Y Cheng, Y Otani, N Takata, A Suzuki, M Kobashi, M Kato</i>	
Micro-Macro Relationship Between Microstructure and Mechanical Behavior of 316L Stainless Steel Fabricated Using L-PBF Additive Manufacturing.....	173
<i>C Ozdogan, R A Yildiz, L Tavares, M Malekan</i>	
Improved Corrosion Resistance of Powder Manufactured AISI 904L Parts by Hot Isostatic Pressing Post Treatment.....	179
<i>A Sorea, P Valler, P Kjeldsteen, P Hjelmehorn</i>	
Additive Manufacturing of 7xxx Aluminium Alloys by Laser Powder Bed Fusion.....	185
<i>K Zhang, S Wenner, C D Marioara, E W Hovig, Q Du, M Onsjoen, K Marthinsen</i>	
On the Chemical Composition, Microstructure and Mechanical Properties of a Nitrogen-Contaminated Ti-6Al-4V Component Built by Wire-Arc Additive Manufacturing .....	191
<i>D Hu, R Biswal, V K Sahu, J W Fellows, A Zadehkhair, S W Williams, A E Davis</i>	
Processability of K340 Cold Work Tool Steel by Directed Energy Deposition Technique .....	197
<i>Ms Kenevisi, Pa Martelli, Fs Gobber, D Ugues, S Biamino</i>	
Microstructure Evolution and Precipitation Strengthening Behaviour of Additively Manufactured High-Speed Steels .....	203
<i>H Zhang, D A Venero, J Park, S V Petegem, A Özsoy, G Soundarapandiyam, S Robertson, X Zhang, B Chen</i>	
Challenges in Characterizing Additively Manufactured AlSi10Mg Using X-Ray Laue Micro-Beam Diffraction .....	209
<i>Y Zhang, M Defer, W Liu, E F F Knipschildt-Okkels, J Oddershede, A Slyamov, F Bachmann, E Lauridsen, D Juul Jensen</i>	
The Effect of Processing Parameters on Dislocation Density and Tensile Properties in Laser Powder Bed Fusion 316L .....	215
<i>M Schreiber, C Brice, K Findley, J Klemm-Toole, J Gockel</i>	
Understanding Fatigue Crack Propagation Pathways in Additively Manufactured AlSi10Mg .....	221
<i>S Rangaraj, S S I Ahmed, A Davis, P J Withers, A Gholinia</i>	
Effect of Hot Isostatic Pressing on the Microstructure of Laser Powder Bed Fused A20XTM Alloy.....	227
<i>J Barode, E Bassini, A Aversa, D Manfredi, D Ugues, S Biamino, M Lombardi, P Fino</i>	
Characterization of Si Particles in Additively Manufactured AlSi10Mg Using Synchrotron Transmission X-Ray Nanotomography .....	233
<i>M Defer, S Dasgupta, A J Shahani, X Xiao, D Juul Jensen, Y Zhang</i>	
Grain Size Assessment Using EBSD on Heterogeneous Additively Manufactured Microstructures .....	239
<i>J Del Gaudio, J Donoghue, P J Withers, A Garner, K Mingard, M Gee, A Gholinia</i>	
Applying Lab-Based DCT to Reveal and Quantify the 3D Grain Structure of a Miniature Chess Rook Produced by Binder Jetting.....	245
<i>J Sun, F Bachmann, J Oddershede, E Lauridsen</i>	

Influence of Printing Parameters on Part Density in L-BPF of Ti-6Al-4V and Correlation with Static Mechanical Properties Measured Using Indentation Testing .....	251
<i>J Schulz, E C Santos, A Kalliath, B Schmaling, P Zok, S Siegert, I S Dandu, Kh Lindner, E Bruder, K Durst</i>	
Cracking Mechanism in E-Beam 3D-Printed DZ125 Ni-Based Superalloys .....	257
<i>Z Wang, Y Lin, Y Zhao, F Shangguan, K Chen</i>	
Revisiting the Theory of Spinodal Strengthening: Implications for Inhomogeneous Additive and Irradiated Structural Alloys .....	263
<i>Riccardo Civierno, Anter El-Azab</i>	
Effect of Microstructural Heterogeneity and Grain Morphology on the Annealing Behavior of Additively Manufactured Metastable $\beta$ Titanium Alloy .....	269
<i>J Q Chang, Y N Wu, Z B Zhang</i>	
Multiscale Characterization of the Additive-Manufacturing-Induced Cell Structure in 316L Stainless Steel: A Comparative Study .....	275
<i>X Wang, V K Nadimpalli, D Juul Jensen, T Yu</i>	
Neutron Diffraction Analysis of Microstructural Evolution and Mechanical Behavior in an Additively Manufactured Multiphase Alloy .....	281
<i>K Yamanaka, M Mori, Y Onuki, S Sato</i>	
Synthesis and Characterization of the Dealloyed Hierarchical Structure of AlSi10Mg-Cu Alloys Prepared Using Laser-Powder Bed Fusion .....	286
<i>S Sun, C F Zhang, W Y Wang, A Godfrey</i>	
Microstructural Characterization of AISI 440C Stainless Tool Steel Fabricated by Laser Powder Bed Fusion .....	292
<i>Z Pan, Y Zhang, M Defer, X Xiao, D Juul Jensen, V K Nadimpalli</i>	
Effect of Solution Treatment Temperature on Recrystallisation Behaviour of Haynes 282 Manufactured Through Laser Powder Bed Fusion .....	298
<i>K Swaminathan, J Andersson</i>	
Effect of Multi-Pass Shot Peening on the Microstructure of LPBF AlSi10Mg Alloy .....	304
<i>P Snopinski, T Yu, X Zhang, D Juul Jensen</i>	
Elucidating the Impact of Laser Beam Shape on the As-Printed Microstructure in 316L Stainless Steel .....	310
<i>W E Alphonso, M A Ribeiro, R Rothfelder, M Schmidt, J H Hattel, D Juul Jensen, M Bayat</i>	
Integration of Spray-Formed AISI H13 Overspray Powder in Additive Manufacturing to Enable a Circular Ecosystem .....	316
<i>M R L Zwicker, N S Tiedje, T Dahmen, V K Nadimpalli</i>	
Recrystallization Kinetics in 3D Printed 316L Stainless Steel .....	322
<i>C Zhang, S Ahmed, V K Nadimpalli, T Yu, D Juul Jensen</i>	
Exploring the Feasibility of Preparing Ti/Ti6Al4V Composites by Laser Powder Bed Fusion .....	328
<i>J Shen, Z Pan, V K Nadimpalli, T Yu</i>	
Cold Spray - A Solid-State Additive Manufacturing Technology .....	334
<i>Congcong Su, Yan Wang, Hanqing Che, Stephen Yue, Xiaoxu Huang</i>	

**Author Index**