International Journal of Chemical Sciences

Characterization techniques for metal additive manufacturing

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Abstract

With the advent of metal Additive Manufacturing (AM) as a viable functional product manufacturing, it is necessary to understand the microstructural characteristics arising from novel materials and processing conditions. Because of the non-equilibrium thermodynamics associated with metal AM and the varying microstructural scales, the characterization techniques are important. This presentation examines various applicable metallurgical techniques to characterize materials, processing effects, and products in metal AM. Macro-, meso-, micro- and nano-scale characterization of the internal structure will be presented to show how various techniques can be specifically utilized to better understand the materials and processing conditions and their effects on the performance of these materials for various applications.

Examples of common metal AM materials such as Al, Ti, Stainless Steel, and Ni alloys will be presented to show the importance and utility of materials characterization at various phases of AM processing. Characterization techniques such as chemical analysis, metallography, x-ray diffraction, Scanning Electron Microscopy, micro CT scan, and Atom Probe Tomography will be discussed.

Biography

Prabir K Chaudhury is President and Consultant at Education and Consulting LLC. He is engaged in advancing materials and processing technologies for Metal Additive Manufacturing. During his professional career, he has worked in and with the metalworking industry to develop new materials, processes and products. Recently he has developed and patented high-performance aluminum alloys for Laser Powder Bed Fusion (LPBF) AM process. He has authored and instructed many Materials Science and Engineering (MSE) courses to engineering professionals and university students. He has a PhD in Engineering from University of California, Irvine. He is a recipient of Phi Beta Kappa International Student award as well as the ASM International Lecturer of the Year award. He has published approximately 50 refereed journals and conference proceedings, more than 100 Atlas of Formability bulletins, and made numerous presentations at conferences and professional meetings.

3rd International Conference on Materials Science and Chemistry | July 23, 2020

Abstract Citation: Prabir K Chaudhury, *Characterization techniques for metal additive manufacturing,* Euro Materials Chemistry 2020, 3rd International Conference on Materials Science and Chemistry, July 23, 2020, Page 07