THE MATERIALS SCIENCE OF ADDITIVE MANUFACTURING

This special issue of the Journal of Materials Research contains articles that were accepted in response to an invitation for manuscripts.

Introduction

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Additive Manufacturing (AM) covers a wide range of processes, ranging from rapid prototyping technologies for polymers to directed energy deposition and powder bed fusion processes for metals and ceramics. In all cases, AM processes involve the layer-by-layer deposition of material from a digital file. Even though these processes may be known by a variety of commercial names, the general characteristics of the processes are similar, as are their impacts on different material systems.

The flexibility of the process provides unprecedented design freedom by allowing the direct fabrication of complex geometries with unique material combinations. However, the interactions between the high energy density sources (laser and electron beams) and the materials being deposited create complex processing conditions that have a significant impact on the material properties. With the wide ranging possibilities inherent in AM produced components, a fundamental understanding of the process/structure/property relationships across different material systems will allow for specific material properties to be obtained.

This Focus Issue of *Journal of Materials Research* is dedicated to the most recent advances in the characterization of processing/structure/property relationships in AM produced metallic, ceramic, and polymer systems. The breadth of different properties and behaviors across these different materials systems makes the characterization of AM materials extremely complex and a fertile subject for investigation. Many of these issues are addressed in this collection of papers. Such a wide range of unique research areas and the breadth of materials examined in this issue is evidence of the scope of materials issues in additive manufacturing and a glimpse into the future.

We are grateful to both the authors and reviewers of the many high-quality manuscripts submitted to this *JMR* Focus Issue on The Materials Science of Additive Manufacturing.

https://doi.org/10.1557/jmr.2014.246 Published online by Cambridge University Press

DOI: 10.1557/jmr.2014.246

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