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Materials Science in Additive Manufacturing

EDITORIAL

Editors' foreword to the inaugural issue of Materials Science in Additive Manufacturing

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From rapid prototyping to additive manufacturing (AM), as it is formally known today, the development of these advanced manufacturing techniques has been complemented with rapid research and innovations in materials science. The requirements for appropriate process and the selection of suitable materials that can be processed by this process are critical for AM applications. As AM matures, specific classes of material have become associated with their corresponding AM processes and applications. Conventionally, AM materials include metals[1], polymers[2], and ceramics[3,4] that have been applied to manufacturing functional parts in high-value industries such as biomedical and aerospace. With recent advancements, biomaterials such as living cells and tissues for 3D bioprinting[5,6] and even edible materials for 3D food printing[7,8] have garnered significant attention. Development of these materials are still ongoing, which drives new frontiers in AM, such as multi-material 3D printing[9-12], artificial intelligence for material design[13], and 4D printing, which incorporate the use of smart materials[14,15].

Materials Science in Additive Manufacturing (MSAM) aims to bridge the cutting-edge research between AM and the entire spectrum of materials science. The journal covers all applied and fundamentals of processing, synthesis, structure, composition, properties, and performance of materials designed or manipulated for AM. In this inaugural issue, six articles spanning across a wide range of topics are collected. Dharmawan and Song presented a new approach to perform cylindrical path planning for directed energy deposition and studied how this approach affects the material properties of parts fabricated[16]. Sehhat *et al.* investigated the effect of powder characteristics on the part properties fabricated by laser powder bed fusion[17]. Gong *et al.* then investigated the use of machine learning approaches to link microstructure of parts produced by electron beam powder bed fusion to their mechanical properties and established the process-structure-properties relationship for the material[18]. To fabricate crack-free aluminum alloys using laser powder bed fusion, Yu *et al.* studied the effect of modifying the alloy compositions with zirconia[19]. Fei *et al.* developed a novel manufacturing system that is capable of thixotropically process and 3D print low melting alloys into functional parts[20]. Finally, Khan *et al.* used robotics to enhance 3D bioprinting by studying a hybrid fabrication approach for biological scaffolds using soft bio-inks[21].

Last but not least, the editorial team of MSAM looks forward to welcoming all relevant submissions to the journal and the effectual and rewarding interactions in the field.

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