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Editorial

Emerging Materials for Additive Manufacturing

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Additive manufacturing (AM) has grown and evolved rapidly in recent years. There are many exciting research and translational works in many areas of application, such as biomedical [1,2], aerospace [3,4] and electronics [5–7]. These advancements are typically coupled with materials development, which has resulted in more functionalities added to 3D printed parts, such as multi-material fabrications [8–10] and integration with machine learning or digital twins [11–13]. Such enhancements in functionalities have enabled the evolution of AM from a rapid prototyping tool to an actual manufacturing solution.

In this Special Issue, state-of-the-art research and review articles on emerging material systems for AM are collected, with a focus on the process–structure–properties relationships. In total, two reviews and thirteen original research articles are included. In their review article, Minasyan and Hussainova discussed the recent developments of ceramic particulate-reinforced aluminium alloys produced by laser powder bed fusion [14], while Hou et al. elaborated the use of monitoring systems for powder bed fusion processes with a focus on metals in their comprehensive review [15]. For original research, Gatões et al. studied the fabrication of different stainless steels using selective laser melting, a type of laser powder bed fusion technique [16]. In their study, Mally et al. benchmarked the mechanical properties of ferritic steels produced by selective laser melting with relevant forged parts [17]. Using selective laser melting as well, Koh et al. studied the fabrication of silica-reinforced steel matrix nanocomposites [18]. Lim et al. studied the bone conduction capacity of highly porous titanium scaffolds with different designs produced by selective laser melting [19]. Chen et al. studied the effect of laser scanning speed on the microstructure and mechanical properties of K418 nickel-based alloy produced by laser powder bed fusion [20]. Böhm et al. evaluated the feasibility of using a mixture of two aluminium alloys to eliminate solidification cracks formed during laser powder bed fusion [21]. Chen et al. studied the fabrication of bimetallic structures using TiNi-based shape memory alloy by laser-directed energy deposition [22]. Also using laser-directed energy deposition, Menon et al. attempted to quantify the process using multi-fidelity surrogate-based process mapping [23]. Hein et al. studied the effect of heat treatment on metastable β titanium alloy produced by laser powder bed fusion [24]. Romani et al. studied the metallization of recycled glass fibre-reinforced polymers that are processed by UV-assisted 3D printing [25]. Hailu et al. studied the effect of structure design on the performance of functionally graded materials produced by the MultiJet Fusion technique [26]. Marczyk et al. analysed the use of concrete–geopolymer hybrids reinforced with aramid roving for 3D concrete printing [27]. Yao et al. evaluated the feasibility of colour 3D printing by studying the pigment penetration in powder-based additive manufacturing [28].

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