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Editorial

Selective Laser Melting: Materials and Applications

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Additive manufacturing (AM) is one of the emerging manufacturing techniques of immense engineering and scientific importance and is regarded as the technique of the future [1–3]. AM can fabricate any kind of material, including metals, polymers, ceramics, composites, etc. Selective laser melting (SLM), also known as the laser-based powder bed fusion process (LPBF), is the most widely used AM techniques that can fabricate a wide variety of materials, including Al-based [4–6], Fe-based [7–10], Ti-based [11–13], Co-based [14–16], Cu-based [17–19] and Ni-based alloys [20–22], etc. Similar to any AM processes, the SLM/LPBF process also offers several advantages, like added functionality, near-net-shape fabrication with minimal or no post-processing, shorter lead-time, offer intricacy for free, etc. [23–25]. The SLM process has its applications in the aerospace, automobile, oil refinery, marine, construction, food and jewelry industries, etc. [26–28]. However, there exist some shortcomings in the SLM field, which are (a) SLM-based alloy development [29], (b) the premature failure of materials, even though improved properties are observed [30], (c) process innovation and development, (d) structure-property correlation and (e) numerical simulations, etc.

Accordingly, the present Special Issue (book) focuses on the two main aspects: materials and applications. Alloy design and development that suits the specific process conditions is essential, rather than using the conventionally designed/available materials. The application spectrum is getting wider day by day, hence the need for our attention. Overall, six articles are published under this Special Issue, with the following themes:

- AlSi10Mg alloy focusing on microstructure and fatigue properties with the influence of HIP process [31], dimensional and distortion analysis of thin walled parts [32] and intra- and inter-repeatability of profile deviations in tooling components (3 articles) [33].
- Ti6Al4V—effect of build orientation with microstructure-property correlations (1 article) [34].
- 304L—correlation between build parameters and compressive properties (1 article) [35] and
- Finally, phase change with density variation and cylindrical symmetry—applications to SLM (1 article) [36].

The outcome of the Special Issue suggests that research is thriving in the field of SLM, especially in microstructure and property correlations. The present Special Issue is interesting particularly because it covers different materials, including AlSi10Mg, Ti6Al4V and 304L stainless steel and gives an overview of microstructure-property correlation in this field.

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