Issues in Metal Matrix Composites Fabricated by Laser Powder Bed Fusion Technique: A Review

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Abstract

The success in metal matrix composites (MMCs) fabrication by laser powder bed fusion (L-PBF) technique has opened doors to further advanced materials development. But the drive to produce fully dense MMCs from a combination of metal and ceramic materials still faces serious setbacks arising from the associated complex phenomena and defects formation. This article discusses some of the issues that encourage defects generation in particulate-reinforced MMCs. It further presents an overview of the additive manufacturing (AM)defects influenced by reinforcement addition and mitigation strategies. The review seeks to broaden the scope of L-PBF fabrication defects concerning MMCs, and give a perspective on tailor designing feedstock materials for AM fabrication of high-quality MMCs. Powder particles segregation, inappropriate scanning strategy, and combine effect of influencing parameters (processing and material) and defects are issues not often accounted for that encourage processing defects in MMCs. A holistic approach that accounts for all the controllable and materials related parameters, irrespective of their negligible influences on the optimal processing window, is expected to enhance the quality of L-PBF-fabricated MMCs. Furthermore, tailor designing of the feedstock materials may offer enhanced reinforcement material dispersion within the matrix and help reduce attendant defects from uneven reinforcement particles dispersion.