Tech Science Press

ICCES, 2024, vol.32, no.1
DOI: 10.32604/icces.2024.011990

PROCEEDINGS

High-Resolution Multi-Metal 3D Printing: A Novel Approach Using Binder Jet Printing and Selecting Laser Melting in Powder Bed Fusion

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ABSTRACT

This study introduces a novel method that combines Binder Jet Printing (BJP) and Selective Laser Melting (SLM) techniques to achieve unprecedented high-speed and high-resolution 3D printing of fine metal powders in Laser Powder Bed Fusion (LPBF). Our approach comfortably attains a resolution of 0.2 mm, enabling the selective deposition of fine powder (D50: 30 μm) made from multiple materials within a single print layer. We demonstrate the capability of this technique through the printing of a composite structure composed of copper alloy and 18Ni300 Maraging tool steel, showcasing its potential for fast-cooling tooling applications. The quality of fusion between the different materials was meticulously analyzed through cross-sectional observation and further substantiated by Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray Spectroscopy (EDX) analysis to study the migration of various elements within the printed sample. Additionally, we report the successful hardening of the demonstrator components through aging, achieving a hardness of 50 HRC. This development not only marks a significant advancement in additive manufacturing technology but also broadens the spectrum of applications for multi-material 3D printing, including different polymeric materials for soft robotics.

KEYWORDS

Multi-material; multi-metal; metal additive manufacturing; laser bed powder fusion; selective laser melting; binder jet printing

Acknowledgement: The authors wish to express their sincere gratitude to the Singapore Institute of Manufacturing Technology for their unwavering support and to the A*STAR (Agency for Science, Technology and Research) research entities in Singapore for their generous funding and invaluable guidance throughout the duration of this project. Their contributions were instrumental in the realization of this research and have significantly propelled our efforts towards advancing the field of additive manufacturing.

Funding Statement: This work was supported by 2022 A*STAR Career Development Fund-Seed Project (C222812012).

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.