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高功率激光选区熔化成形工艺基础研究

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激光选区熔化（SLM）是当今发展最快的金属增材制造技术，特别适用于复杂金属构件的高性能、高精度、集成制造。然而，常规SLM工艺的成形效率极低，无法支持规模化工业生产。提升激光功率是突破上述技术瓶颈的重要途径，但目前国内外针对高功率SLM工艺的研究尚不够系统，特别是采用的激光功率一般不超过1kW，成形效率提升幅度有限。针对这些问题，以不锈钢和铝合金为典型材料，系统研究了激光功率、光斑模式、铺粉层厚等关键工艺参数对高功率（>1kW）SLM成形质量与成形效率的影响。研究表明，将SLM成形所用的激光功率提升至2kW甚至更高是可行的。工艺参数选择合适时，高功率SLM成形件的基础力学性能超过常规工艺水平，且单激光的成形效率达到甚至超越现有的多激光SLM。

关键词：激光选区熔化；高功率激光；组织性能；成形效率

参考文献

[1] Zhong Q., Wei K.*, Ouyang T., Li X. and Zeng X., Effect of rotation angle on surface morphology, microstructure, and mechanical properties of Inconel 718 alloy fabricated by high power laser powder bed fusion, Journal of Materials Science & Technology, 154, 30-42 (2023).

[2] Zhong Q., Wei K.*, Lu Z., Yue X., Ouyang T. and Zeng X., High power laser powder bed fusion of Inconel 718 alloy: Effect of laser focus shift on formability, microstructure and mechanical properties, Journal of Materials Processing Tech., 311, 117824 (2023).

[3] Liu M., Wei K.*, Zhou R., Yue X. and Zeng X., Microstructure and mechanical property of high power laser powder bed fusion AlSi10Mg alloy before and after T6 heat treatment, Virtual and Physical Prototyping, (2022), https://doi.org/10.1080/17452759.2022.2068294.

[4] Liu M., Wei K.*, Yue X. Huang G., Deng J. and Zeng X., High power laser powder bed fusion of AlSi10Mg alloy: Effect of laser beam mode, Journal of Alloys and Compounds, 909, 164779 (2022).

[5] Huang G., Wei K.*, Deng J. and Zeng X., High-power laser powder bed fusion of 316L stainless steel: Defects, microstructure, and mechanical properties, Journal of Manufacturing Processes, 83, 235-245 (2022).

[6] Liu M., Wei K.* and Zeng X., High power laser powder bed fusion of AlSi10Mg alloy: Effect of layer thickness on defect, microstructure and mechanical property, Materials Science & Engineering A, 842, 143107 (2022).

[7] Huang G., Wei K.*, Deng J. and Zeng X., High power laser powder bed fusion of 18Ni300 maraging steel: Processing optimization, microstructure and mechanical properties, Materials Science & Engineering A, 856, 143983 (2022).

[8] Huang G., Wei K.*, and Zeng X., Microstructure and mechanical properties of H13 tool steel fabricated by high power laser powder bed fusion, Materials Science & Engineering A, 858, 144154 (2022).

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