

Tailoring Post-Processing of Additively Manufactured Inconel 718: Influence of LPBF Parameters and Heat Treatment Strategies

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This study investigates the combined influence of laser powder bed fusion (LPBF) parameters and post-build heat treatment on the microstructure and hardness of Inconel 718. Cylindrical specimens were produced using an EOS M290 system under varied combinations of laser power and scanning speed to assess the impact of process-induced microstructural variations. Four conditions were analysed: the as-built state, the standard EOS heat treatment and two modified regimes featuring solution annealing at 954 °C and 980 °C, respectively, followed by double ageing. Microstructural characterisation was performed using electron backscatter diffraction (EBSD), focusing on grain refinement, recrystallisation, and texture evolution. Hardness measurements were correlated with microstructural features to evaluate the effectiveness of each heat treatment route. The results demonstrate that tailored thermal post-processing can enhance mechanical performance and provide viable alternatives to conventional schedules. This work contributes to the optimisation of AM IN718 for critical aerospace and energy applications.