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Microstructural response of Ti6Al4V ELI alloyed with molybdenum by direct energy deposition

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Abstract

Alloy development opens the way to create new materials for specialized processes, and attain materials that are usually difficult to acquire. Property enhancements and part performance is achievable in an exciting new way when this technique of producing materials is coupled with additive manufacturing technologies. This study explores the use of direct energy deposition technique of additive manufacturing processing for alloy development. The aim was to improve the ductility and subsequent part performance of LENS produced titanium alloys. In this study, the investigated heat inputs proved effective in producing homogenous molybdenum added Ti6Al4V microstructures. Consequently, the addition of the β-stabilizing alloying element, molybdenum, did not only result in the increased volume fraction of the β-phase but also the change from planar to cellular solidification. Thus, the hardness values for molybdenum additions of 10 mass percentage were found to be in the range of 200 ± 34 HV0.3, and this was attributed to the β-stabilizing and grain refining effect of refractory metals such as molybdenum.