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# Microstructural Properties of Heat-Treated LENS In Situ Additively Manufactured Titanium Aluminide

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ABSTRACT:

This study reports on the microstructure, phase identification and hardness property of the LENS-manufactured binary Ti-Al alloy which was achieved via laser in situ alloying. The in situ alloying method, using laser beam as an energy source, indicated that it is possible to achieve a binary gamma phase microstructure from elemental powders of Ti and Al. The as-produced sample, however, was characterized of having different microstructure at the top, middle and bottom regions. The middle and top layers had similar hardness which was lower than that of the bottom region. The as heat-treated sample was characterized of lamellar grain microstructure at the top and just grains at the bottom and the middle. The observed grains were different in size, phase and hardness. This study indicated that in addition to the pores and the precipitation of $\alpha_2$ phase or aluminum segregation on the grain boundary veins intermetallics lead to severe cracking. Overall, the hardness values of the as-produced and heat-treated samples were similar, and due to extensive cracking, it was inferred that both samples will lack ductility.