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Investigation of martensite α' phase transformation during heat treatment of high-speed selective laser melted Ti6Al4V components

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Abstract:

The investigation of microstructural and hardness properties of high-speed selective laser melted (SLM) produced Ti6Al4V coupons after various heat treatments. Heat treatment was performed in order to homogenize and improve the microstructure of the as-built Ti6Al4V by transforming the acicular martensitic α' phase. Optimized heat treatment parameters were selected based on their impact on the transformation of the acicular martensite α' phase and the phase morphology produced after heat treatment. It was found that sub-transus heat treatments do not completely transform the martensite α' phase, but result in the decrease in hardness. Heat treatment at 1000 °C, for 2 h followed by furnace cooling, transformed the martensitic α' phase into a lamella $\alpha + \beta$ phase. A relationship of hardness, as a function of heat treatment temperature, is also reported.