Effects of Stress-Relieving Heat Treatment on Impact Toughness of Direct Metal Laser Sintering (DMLS)-Produced Ti6Al4V (ELI) Parts

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Abstract

The impact toughness of as-built (AB) and stressed-relieved (SR) direct metal laser sintering-produced Ti6Al4V (ELI) was investigated using the standard Charpy impact test over the temperature range of − 130°C to 250°C. Stress-relieving heat treatment was conducted at 650°C for a soaking period of 3 h in argon gas atmosphere. The results showed improvements in the impact toughness after stress-relieving heat treatment. Stress relieving also shifted the established ductile-to-brittle transition temperature to lower temperatures. Comparative analysis of the impact toughness values for AB and SR specimens at ambient temperature showed them to be 48% and 22% lower than recommended values for use in aircraft structures, respectively.

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