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Elevated temperature mechanical behavior of IN625 alloy processed by laser powder-bed fusion

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Abstract

Inconel 625 alloy tensile specimens fabricated by laser powder-bed fusion and subjected to different post-processing treatments, such as stress relief annealing, low-temperature solution treatment and hot isostatic pressing, were tested at room temperature and at 760°C. These tests revealed significant embrittlement of the laser powder-bed fused specimens at 760°C. The specimens' microstructure and fracture surface were studied before and after tensile testing using scanning and transmission electron microscopy, and the results of that analysis were used to explain the observed phenomenon of elevated temperature embrittlement.

Keywords:

nickel based superalloys, additive manufacturing, selective laser melting, fracture analysis, elevated-temperature embrittlement.

1. Introduction

Laser powder-bed fusion (L-PBF) refers to an additive manufacturing technology capable of processing various metallic materials with complex geometries and promising mechanical properties. Since this technology is rather recent, the mechanical properties of L-PBF processed materials have mainly been studied at room temperature [1-6]. Genuine interest in additive manufacturing of high performance alloys in the aerospace industry

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