

Accepted Manuscript

Effect of solutionizing and aging on the microstructure and mechanical properties of powder bed binder jet printed nickel-based superalloy 625

Amir Mostafaei, Yashar Behnamian, Yuval L. Krimer, Erica L. Stevens, Jing Li Luo, Markus Chmielus

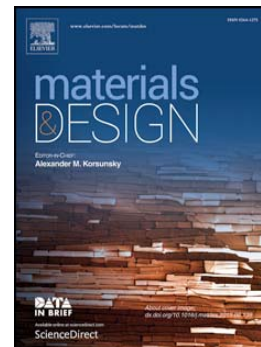
PII: S0264-1275(16)31146-7
DOI: doi: [10.1016/j.matdes.2016.08.083](https://doi.org/10.1016/j.matdes.2016.08.083)
Reference: JMADE 2236

To appear in:

Received date: 17 June 2016
Revised date: 12 August 2016
Accepted date: 29 August 2016

Please cite this article as: Amir Mostafaei, Yashar Behnamian, Yuval L. Krimer, Erica L. Stevens, Jing Li Luo, Markus Chmielus, Effect of solutionizing and aging on the microstructure and mechanical properties of powder bed binder jet printed nickel-based superalloy 625, (2016), doi: [10.1016/j.matdes.2016.08.083](https://doi.org/10.1016/j.matdes.2016.08.083)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Effect of solutionizing and aging on the microstructure and mechanical properties of powder bed binder jet printed nickel-based superalloy 625

Amir Mostafaei ^{a,1}, Yashar Behnamian ^b, Yuval L. Krimer ^a, Erica L. Stevens ^a, Jing Li Luo ^b, Markus Chmielus ^{*,a}

^a Department of Mechanical Engineering and Materials Science, University of Pittsburgh, Pittsburgh, PA 15261, USA

^b Department of Chemical and Materials Engineering, University of Alberta, Edmonton, Alberta T6G 1H9, Canada

* Corresponding author: Markus Chmielus, Email address: chmielus@pitt.edu

¹ Amir Mostafaei, Email address: amir.mostafaei@pitt.edu

Abstract

In this study, the influence of solutionizing and aging treatments on the microstructure and mechanical properties of alloy 625 superalloy samples produced by powder bed binder jet printing was investigated. Vacuum melted argon atomized 625 superalloy powder was used to fabricate green parts. Samples vacuum sintered at 1280 °C for 4 h to optimize density to 99.6% were subjected to solution and aging treatments at 1150 °C for 2 h and 745 °C for 20 h and 60 h, respectively, in order to improve microstructure and mechanical properties. Elemental analysis, phase formation and microstructure of the sintered, solution treated and aged samples were investigated by using optical, scanning/transmission electron microscopy with electron dispersive spectroscopy, and X-ray diffraction. The results indicate that the aging treatment resulted in the formation of intermetallic phases such as Ni₃Nb and Ni₂(Cr,Mo) as well as carbides such as NbC, Cr₂₃C₆ in the microstructure. While the microhardness and tensile strength of the aged specimen increased due to these phases, the ductility value decreased. This study shows that alloy 625 produced by binder jet printing subjected to aging treatments has comparable properties to cast alloy 625.

Keywords: Additive manufacturing; Inconel 625; Heat treatment; Tensile test; TEM; Precipitation.

Download English Version:

<https://daneshyari.com/en/article/5024243>

Download Persian Version:

<https://daneshyari.com/article/5024243>

[Daneshyari.com](https://daneshyari.com)