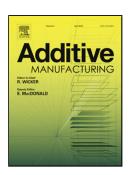
Accepted Manuscript

Title: Analysis of melt pool dynamics in laser cladding and direct metal deposition by automated high-speed camera image evaluation



Authors: Florian Wirth, Samuel Arpagaus, Konrad Wegener

 PII:
 S2214-8604(18)30055-1

 DOI:
 https://doi.org/10.1016/j.addma.2018.03.025

 Reference:
 ADDMA 321

To appear in:

Received date:	29-1-2018
Revised date:	26-3-2018
Accepted date:	26-3-2018

Please cite this article as: Wirth F, Arpagaus S, Wegener K, Analysis of melt pool dynamics in laser cladding and direct metal deposition by automated high-speed camera image evaluation, *Additive Manufacturing* (2010), https://doi.org/10.1016/j.addma.2018.03.025

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.

ACCEPTED MANUSCRIPT

Analysis of melt pool dynamics in laser cladding and direct metal deposition by automated high-speed camera image evaluation

Florian Wirth^{*}, Samuel Arpagaus^{*}, Konrad Wegener[#]

^{*}*inspire AG, ETH Zürich, Technoparkstr. 1, 8005 Zurich, Switzerland* [#]*Institute of Machine Tools and Manufacturing, ETH Zürich, Leonhardstr. 21, 8092 Zurich, Switzerland*

Corresponding Author: Florian Wirth e-mail: wirth@inspire.ethz.ch tel.: +41 44 633 78 74 fax: +41 44 632 11 59

Abstract

Although the melt pool convection currents influence the dilution, porosity and distribution of potentially included hard phase particles such as carbide or other ceramic particles, which are added to increase the wear resistance of the deposited material, there is only limited knowledge of melt pool dynamics within blown powder additive manufacturing processes. In the pursuit of a deeper understanding, a high-speed camera has been used to observe melt pool dynamics during laser cladding at a frame rate of up to 67'000 frames per second, allowing for the particles that swim on the surface to be traced automatically. The resulting videos allow for the melt pool surface behavior to be investigated using a specifically developed automated high-speed camera image evaluation technique. This method has been tested for reliability and applied to investigate the process parameter influence on melt pool dynamics. The results show, that there is no pronounced laminar flow on the melt pool surface, instead a remarkable randomness to the direction of particle flow can be observed. That being said, it is still possible to identify certain flow tendencies that can be explained by surface tension phenomena like the Marangoni effect and which depend on the process parameters.

Download English Version:

https://daneshyari.com/en/article/7205897

Download Persian Version:

https://daneshyari.com/article/7205897

Daneshyari.com