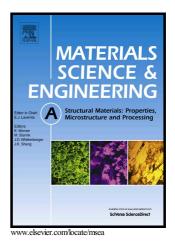
Author's Accepted Manuscript

Nano-scale Characterization of White Layer in Broached Inconel 718

Zhe Chen, Magnus Hörnqvist Colliander, Gustav Sundell, Ru Lin Peng, Jinming Zhou, Sten Johansson, Johan Moverare



PII:S0921-5093(16)31536-2DOI:http://dx.doi.org/10.1016/j.msea.2016.12.045Reference:MSA34476

To appear in: Materials Science & Engineering A

Received date: 2 September 2016 Accepted date: 9 December 2016

Cite this article as: Zhe Chen, Magnus Hörnqvist Colliander, Gustav Sundell, Ri Lin Peng, Jinming Zhou, Sten Johansson and Johan Moverare, Nano-scal Characterization of White Layer in Broached Inconel 718, *Materials Science c Engineering A*, http://dx.doi.org/10.1016/j.msea.2016.12.045

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable 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

Nano-scale Characterization of White Layer in Broached Inconel 718

Zhe Chen^{a*}, Magnus Hörnqvist Colliander^b, Gustav Sundell^b, Ru Lin Peng^a, Jinming Zhou^c, Sten Johansson^a, Johan Moverare^a

^aDivision of Engineering Materials, Linköping University, 58183 Linköping, Sweden ^bDepartment of Physics, Chalmers University of Technology, 41296 Gothenburg. Sweden ^cDivision of Production and Materials Engineering, Lund University, 22100 Lund, Sweden ^{*}Corresponding author Tel.: +46 13 281784 Fax: +46 13 282505 Email address: zhe.chen@liu.se

Abstract

The formation mechanism and properties of white layers created during broaching are not well investigated and understood to date. In the present study, multiple advanced characterization techniques with a nano-scale resolution, including transmission electron microscope (TEM), transmission Kikuchi diffraction (TKD), atom probe tomography (APT) as well as nano-indentation, have been used to systematically examine the microstructural evolution and corresponding mechanical properties of a surface white layer formed when broaching the nickel-based superalloy Inconel 718.

The TEM observations showed that the broached white layer consists of nano-sized grains, mostly in the range of 20 nm to 50 nm. The crystallographic texture detected by TKD further revealed that the refined microstructure is primarily attributed to strong shear deformation. Co-located Al-rich and Nb-rich fine clusters have been identified by APT, which are most likely to be γ' and γ'' clusters in a form of co-precipitates, where the clusters showed elongated and aligned appearance associated with the severe shearing history. The microstructural characteristics and crystallography of the broached white layer suggest that it was essentially formed by adiabatic shear localization in which the dominant metallurgical process is rotational dynamic recrystallization based on mechanically-driven subgrain Download English Version:

https://daneshyari.com/en/article/5456323

Download Persian Version:

https://daneshyari.com/article/5456323

Daneshyari.com