

Accepted Manuscript

Influence of work-hardening on fatigue crack growth, effective threshold and crack opening behavior in the nickel-based superalloy Inconel 718

Alexander Klumpp, Sven Maier, Hans Chen, Mohammad Fotouhi, Reinhard Schneider, Stefan Dietrich, Karl-Heinz Lang, Volker Schulze

PII: S0142-1123(18)30265-2

DOI: <https://doi.org/10.1016/j.ijfatigue.2018.06.033>

Reference: IIJF 4737

To appear in: *International Journal of Fatigue*

Received Date: 20 March 2018

Accepted Date: 20 June 2018



Please cite this article as: Klumpp, A., Maier, S., Chen, H., Fotouhi, M., Schneider, R., Dietrich, S., Lang, K-H., Schulze, V., Influence of work-hardening on fatigue crack growth, effective threshold and crack opening behavior in the nickel-based superalloy Inconel 718, *International Journal of Fatigue* (2018), doi: <https://doi.org/10.1016/j.ijfatigue.2018.06.033>

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.

Influence of work-hardening on fatigue crack growth, effective threshold and crack opening behavior in the nickel-based superalloy Inconel 718

Alexander Klumpp^{a,*}, Sven Maier^a, Hans Chen^a, Mohammad Fotouhi^b, Reinhard Schneider^b, Stefan Dietrich^a, Karl-Heinz Lang^a, Volker Schulze^a

^a*Institute for Applied Materials (IAM-WK), Karlsruhe Institute of Technology (KIT),
Kaiserstraße 12, 76131 Karlsruhe, Germany*

^b*Laboratory for Electron Microscopy (LEM), Karlsruhe Institute of Technology (KIT),
Kaiserstraße 12, 76131 Karlsruhe, Germany*

Abstract

In this study, the influence of rotary swaging induced cold work on long fatigue crack growth, threshold and opening behavior in the nickel-based superalloy Inconel 718 was investigated. Ambient temperature experiments were carried out using arc-shaped tension specimens according to ASTM standard E399. The direct current potential drop (DCPD) method was used for crack length measurements and crack opening force evaluation. Fatigue crack growth rates (FCGR) measured at load ratios of $R = 0.2$, $R = 0.5$ and $R = 0.7$ were found to increase due to work-hardening in continuous (increasing ΔK) and load shedding (decreasing ΔK) tests. Effective fatigue crack growth thresholds ($\Delta K_{th,eff}$) were determined according to the $K_{max} = const.$ procedure and found to decrease monotonically with increasing degree of work-hardening. Compared to the non-deformed material, crack opening stress intensities K_{op} were reduced in work-hardened states at three different crack lengths. To quantify the detrimental effects of cold work, the effective stress intensity factor range (ΔK_{eff}) model was applied. SEM and TEM micrographs were taken to complement the study.

Keywords: Work-hardening, Rotary swaging, Fatigue crack growth, Effective

*Corresponding author: Tel. +49 721 60842674; Fax: +49 721 60848044
Email address: alexander.klumpp@kit.edu (Alexander Klumpp)

Download English Version:

<https://daneshyari.com/en/article/7171259>

Download Persian Version:

<https://daneshyari.com/article/7171259>

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