

Accepted Manuscript

Experimental study of crack growth under non-proportional loading along with first modeling attempts

Yigiter Hos, Michael Vormwald

PII: S0142-1123(16)30048-2
DOI: <http://dx.doi.org/10.1016/j.ijfatigue.2016.03.036>
Reference: JIJF 3916

To appear in: *International Journal of Fatigue*

Received Date: 15 December 2015
Revised Date: 11 March 2016
Accepted Date: 31 March 2016

Please cite this article as: Hos, Y., Vormwald, M., Experimental study of crack growth under non-proportional loading along with first modeling attempts, *International Journal of Fatigue* (2016), doi: <http://dx.doi.org/10.1016/j.ijfatigue.2016.03.036>

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.



Experimental study of crack growth under non-proportional loading along with first modeling attempts

Yigiter Hos¹⁾ *¹, Michael Vormwald¹⁾

¹⁾Materials Mechanics Group – Technische Universität Darmstadt, Franziska-Braun-Str. 3, D-64287

Darmstadt, Tel. +4961511623082, Fax +4961511623081

Abstract

For various configurations examined in a series of fatigue experiments on thin-walled tubes under tension and torsion, the experimental results (crack path and crack growth life) are measured. Additionally, crack opening and closure was observed applying surface deformation field measurements using digital image correlation. Due to the high applied load amplitudes considerable cyclic plastic deformation occurred especially ahead of the crack front. The material's cyclic plastic behavior was measured and a convenient plasticity model was used for its description. In the finite element analyses, actual geometries of cracked structures have been modeled. The non-linear nature of the cyclic deformation has been taken into account by applying the cyclic plasticity model. Plasticity-induced crack closure is captured by a contact formulation, actually however only for simple tension-compression loading. For the latter case, closure-free cyclic J-integrals were calculated. The crack growth rates measured in the experiments correlate well with the numerically determined cyclic J-integrals for the simple mode I case.

Keywords: Multiaxial fatigue; Mixed mode; Fatigue crack growth.

Nomenclature

$a_i, b_i, c_i^{(i)}$	material constants
$c_T, c_A, c_\chi^{(i)}$	material parameters
E	Young's modulus

*Email hos@wm.tu-darmstadt.de

Download English Version:

<https://daneshyari.com/en/article/5015354>

Download Persian Version:

<https://daneshyari.com/article/5015354>

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