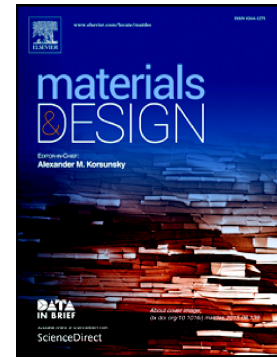


Accepted Manuscript

Fracture mechanics of micro samples: Fundamental considerations

R. Pippan, S. Wurster, D. Kiener



PII: S0264-1275(18)30695-6
DOI: [doi:10.1016/j.matdes.2018.09.004](https://doi.org/10.1016/j.matdes.2018.09.004)
Reference: JMADE 7365
To appear in: *Materials & Design*
Received date: 7 May 2018
Revised date: 31 August 2018
Accepted date: 3 September 2018

Please cite this article as: R. Pippan, S. Wurster, D. Kiener , Fracture mechanics of micro samples: Fundamental considerations. *Jmade* (2018), doi:[10.1016/j.matdes.2018.09.004](https://doi.org/10.1016/j.matdes.2018.09.004)

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.

Fracture mechanics of micro samples: Fundamental considerations

R. Pippan¹, S. Wurster¹, D. Kiener²

¹ Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, 8700 Leoben, Austria

² Department Materials Physics, Montanuniversität Leoben, 8700 Leoben, Austria

Abstract

In this review article we consider the crack growth resistance of micrometer and sub-micrometer sized samples from the fracture mechanics point of view. Standard fracture mechanics test procedures were developed for macro-scale samples, and reduction of the specimen dimensions by three to five orders of magnitude has severe consequences. This concerns the interpretation of results obtained by micro- and nano-mechanics, as well as the life time and failure prediction of micro- and nano-devices. We discuss the relevant fracture mechanics length scales and their relation to the material-specific structural lengths in order to conduct rigorous fracture mechanics experiments. To ensure general validity and applicability of evaluation concepts, these scaling considerations are detailed for ideally brittle, semi-brittle and micro ductile crack propagation, subject to both monotonic and cyclic loading. Special attention is devoted to the requirements for determining specimen size for various loading types to measure material characteristic crack propagation resistance at small scales. Finally, we discuss novel possibilities of micron and sub-micron fracture mechanics tests to improve the basic understanding of specific crack propagation processes.

Download English Version:

<https://daneshyari.com/en/article/11032373>

Download Persian Version:

<https://daneshyari.com/article/11032373>

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