

## Accepted Manuscript

Prediction of Ductile Fracture for Metal Alloys Using a Shear Modified Void Growth Model

Yazhi Zhu, Michael D. Engelhardt

PII: S0013-7944(17)30842-1

DOI: <https://doi.org/10.1016/j.engfracmech.2017.12.042>

Reference: EFM 5823

To appear in: *Engineering Fracture Mechanics*

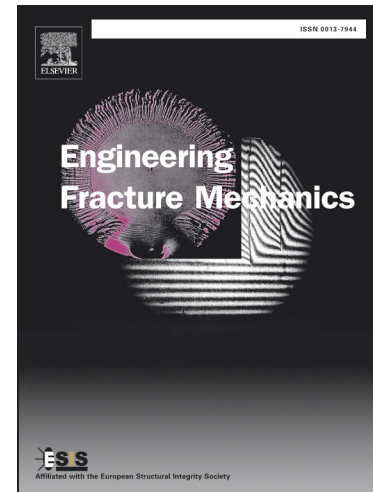
Received Date: 12 September 2017

Revised Date: 20 December 2017

Accepted Date: 29 December 2017

Please cite this article as: Zhu, Y., Engelhardt, M.D., Prediction of Ductile Fracture for Metal Alloys Using a Shear Modified Void Growth Model, *Engineering Fracture Mechanics* (2017), doi: <https://doi.org/10.1016/j.engfracmech.2017.12.042>

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.



# Prediction of Ductile Fracture for Metal Alloys Using a Shear Modified Void Growth Model

Yazhi Zhu, Michael D. Engelhardt

*Ferguson Structural Engineering Laboratory, Dept. of Civil, Architectural and Environmental Engineering, Univ. of Texas at Austin, Austin, TX 78712, U.S*

---

## Abstract

Shear stress ratio have recently been recognized as an important parameter, in addition to stress triaxiality, that influences the initiation of ductile fracture in metals. In this paper, the roles of stress triaxiality and shear stress ratio in the micro-mechanisms of ductile fracture are first discussed. A modified ductile fracture model coupling both stress triaxiality and shear stress ratio is then proposed. The model is developed based on the Rice-Tracey and modified maximum shear stress models. Parametric studies are performed to demonstrate the behaviors of the model parameters. The proposed model is applied to construct the fracture loci of four types of metal alloys: aluminum 2024-T351, aluminum 6061-T6, ASTM A572 Gr. 50 steel and AISI 1045 steel. The predicted results are in good agreement with the experimental data over a wide range of triaxialities. Comparison between the proposed model and several popular fracture criteria is also provided, and the results indicate that the proposed model has significant potential to predict ductile fracture at both low and high triaxialities.

*Keywords:* Ductile fracture, Metal alloys, Void growth, Stress triaxiality, Shear stress ratio

---

## 1. Introduction

Prediction of ductile fracture in crack-free bodies has been of great interest and extensively studied during recent decades. Starting with the micro-

---

*Email addresses:* yzzhu@utexas.edu (Yazhi Zhu), mde@mail.utexas.edu (Michael D. Engelhardt)

Download English Version:

<https://daneshyari.com/en/article/7169121>

Download Persian Version:

<https://daneshyari.com/article/7169121>

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