

## Accepted Manuscript

Fracture characterization of ceria partially stabilized zirconia using the GMTSN criterion

S. Ghouli, M.R. Ayatollahi, A.R. Bushroa

PII: S0013-7944(18)30246-7  
DOI: <https://doi.org/10.1016/j.engfracmech.2018.06.037>  
Reference: EFM 6059

To appear in: *Engineering Fracture Mechanics*

Received Date: 6 March 2018  
Revised Date: 23 June 2018  
Accepted Date: 25 June 2018

Please cite this article as: Ghouli, S., Ayatollahi, M.R., Bushroa, A.R., Fracture characterization of ceria partially stabilized zirconia using the GMTSN criterion, *Engineering Fracture Mechanics* (2018), doi: <https://doi.org/10.1016/j.engfracmech.2018.06.037>

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 characterization of ceria partially stabilized zirconia using the GMTSN criterion

S. Ghouli<sup>a</sup>, M.R. Ayatollahi<sup>a1</sup>, A.R. Bushroa<sup>b</sup>

<sup>a</sup>Fatigue and Fracture Laboratory, school of Mechanical Engineering, Center of Excellence in Experimental Solid Mechanics and Dynamics, Iran University of Science and Technology, Narmak, Tehran 16846, Iran

<sup>b</sup>Centre of Advanced Manufacturing and Material Processing (AMMP), Department of Mechanical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

## Highlights

- The generalized maximum tangential strain (GMTSN) criterion is revisited.
- The influence of T-term on crack initiation angle and onset of fracture is studied.
- Fracture behavior of CeO<sub>2</sub>-TZP disk specimens is predicted using the GMTSN criterion.
- The results of the GMTSN criterion and classical fracture criteria are then compared.
- Improved correlation with experiments is observed when using the GMTSN criterion.

## Abstract

Ceria stabilized tetragonal zirconia polycrystal (CeO<sub>2</sub>-TZP) is one of the zirconia-based materials which is reported to have high fracture toughness and strong resistance to low temperature aging degradation (LTAD). Owing to the brittle behavior of CeO<sub>2</sub>-TZP, its fracture properties can be estimated using the concept of linear elastic fracture mechanics (LEFM). In this paper, the generalized maximum tangential strain (GMTSN) criterion is applied to predict the fracture initiation angles and the onset of fractures of CeO<sub>2</sub>-TZP disk specimens under mixed mode I/II conditions. It is found that the inclusion of T-term, the first non-singular term in strain solution, in the GMTSN criterion would yield significantly improved predictions of the experimental data obtained for CeO<sub>2</sub>-TZP disk specimens and reported in the literature.

**Keywords:** Ceramics; CeO<sub>2</sub>-TZP; fracture properties; strain-based fracture criterion

## 1. Introduction

In recent years, there have been a growing interest in using ceramic materials for engineering purposes, thanks to their special characteristics like high hardness and resistance against abrasion,

<sup>1</sup> Corresponding author. Tel.: +98 21 77240201; fax: +98 21 77240488. E-mail addresses: m.ayat@iust.ac.ir.

Download English Version:

<https://daneshyari.com/en/article/7168723>

Download Persian Version:

<https://daneshyari.com/article/7168723>

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