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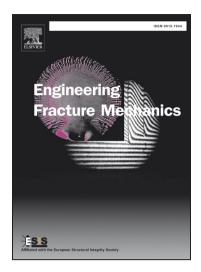
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Fracture characterization of ceria partially stabilized zirconia using the GMTSN criterion

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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 CeO₂-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 (CeO₂-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 CeO₂-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 CeO₂-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 CeO₂-TZP disk specimens and reported in the literature.

Keywords: Ceramics; CeO₂-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,

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