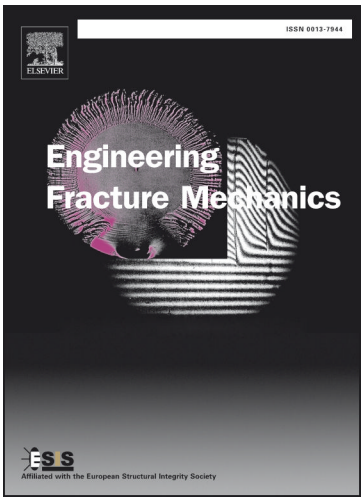

A comparison between routine vs. normalized Cockroft-Latham fracture criteria for prediction of fracture during equal channel angular pressing

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A comparison between routine vs. normalized Cockroft-Latham fracture criteria for prediction of fracture during equal channel angular pressing

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Abstract

In this article, routine and normalized Cockroft-Latham fracture criteria are used to predict fracture during equal channel angular pressing (ECAP) of AZ31 Mg alloy. These models are implemented into finite element simulation using Deform 3D commercial package software. Both models predicted fracture at the first pass of deformation. This observation, i.e., fracture at the first pass, was in line with experimental results. However, the normalized Cockroft-Latham fracture model, indicated slightly diffused fracture at the top and bottom surfaces while the routine Cockroft-Latham fracture model, predicted fracture to start at the top surface and deeply diffused into the middle of the sample which was in perfect agreement with experimental results. The differences in the predictions may be primarily attributed to differences in the nature of calculations of the used criteria. However, more importantly, it is found that the distribution of stress and strain which significantly affect the prediction of fracture are correlatively changed with implementing different models and cause different predictions in damage.

Keywords: Magnesium; Equal channel angular pressing; Fracture.

1 Introduction

Workability of material is an important factor which determines if a specific material may be soundly produced using a specific metal forming process. Metals and alloys with high workability, e.g., Al and Cu