DISSERTATION INFORMATION

Title: **Enhancement of Void Growth Model for the Anisotropic Ductile Metal**

Major:	**Engineering Mechanics**
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The aim of work presented in this dissertation was to produce the enhancement of the existing void growth-based damage models used for predicting ductile fracture of anisotropic sheet metals, which are subjected plastic deformation. The constitutive models were developed within the general framework of ductile damage mechanics. Coupling of the quadratic yield function Hill48 with damage models based on micro-mechanical and continuum damage mechanics (CDM) theories has been chosen to suit the anisotropic behavior of sheet material. The proposed damage models are then implemented by the user material subroutines (VUMAT) and integrated with finite element code of ABAQUS/Explicit software package. The series of tensile experiments in three different orientations of materials are performed for achieving mechanical behavior of high strength sheet aluminum alloys AA6061-T6. The results from these tests allowed derivation of material constants for constitutive models and help to have a better understanding of anisotropic material behavior. In addition, the tensile tests were also used to validate the implementation and accuracy of constitutive material models. The proposed constitutive models have been evaluated through numerical simulations of tensile, deep drawing and Nakajima tests. The micro-crack and fracture initiation, crack path and forming limit diagram (FLD) are predicted using these constitutive models.

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