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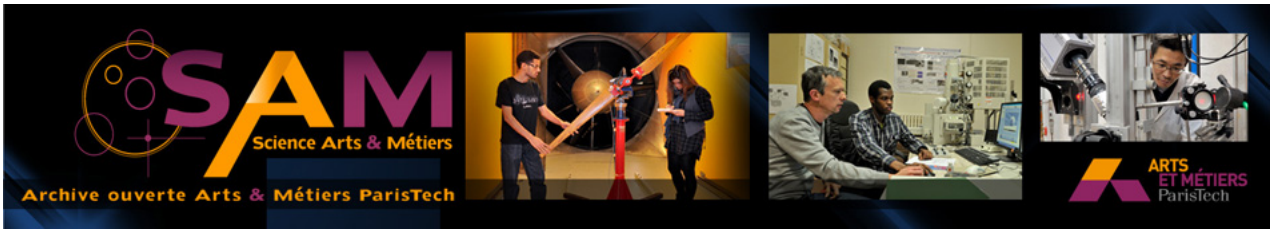


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# PREDICTION OF STRAIN LOCALIZATION IN SHEET METAL FORMING USING ELASTOPLASTIC-DAMAGE MODEL AND LOCALIZATION CRITERION

Badis Haddag [1], Farid Abed-Meraim [1], Tudor Balan [1]

1 LPMM, UMR7554, ENSAM Metz, 4 rue Augustin Fresnel, 57078 Metz Cedex 3, France

**Keywords:** Strain localization, FLD, strain path change, damage, anisotropy, FE simulation, sheet metal forming

* Corresponding author: badis.haddag@metz.ensam.fr

**Abstract**

The aim of this work is to study the strain localization during the plastic deformation of sheets metals. This phenomenon is precursor for the fracture of drawing parts, thus its prediction using advanced behavior models, such as in [2], is important in order to obtain safe final parts. Most often, an accurate prediction of localization during forming process requires damage to be included in the simulation.

For this purpose, an advanced, anisotropic elastoplastic model, combining isotropic and kinematic hardening, has been coupled with an isotropic damage model [1]. The coupling with the damage model is carried out within the framework of continuum damage mechanics [3]. The resulting model is then able to reproduce both strain path change phenomena and damage evolution. In order to detect the strain localization during sheet forming process, Rice's localization criterion is combined with this model [4].

The coupled elastoplastic-damage model is implemented in the Abaqus/Implicit software, via the user routine UMAT, while Rice's criterion is incorporated in the same code, via the user routine UVARM. Simulations of typical rheological tests are performed in the numerical investigation. The predicted forming limit diagrams are found in good agreement with literature results. More specifically, the fully-3D formulation which is adopted in our development allowed for some new results – as the out-of-plane orientation of the normal to the localization band.

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