

Edge tracing technique to study post-necking behavior and failure in Al-alloys and anisotropic plasticity in line pipe steels

Zacharie Shokeir¹, Jacques Besson², Chiraz Belhadj², Tom Petit¹, and Yazid Madi²

¹Université Paris-Saclay CEA DES - Service d'Etude des Matériaux Irradiés 91191
Gif-sur-Yvette France

²MINES Paris PSL Research University Centre des Matériaux CNRS UMR 7633 BP 87
91003 Evry France

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Abstract

The recently developed Edge Tracing (ET) method allows to estimate the radial deformation in axisymmetric tensile specimens via analysis of digital images recorded during the experiments. Images are processed to detect the sample's contours and therefore, estimate the minimal cross-section diameter. This technique was mainly developed to characterize the elastic-plastic behavior well beyond the necking strain. The aim of this work is to extend the ET method to two case studies. Firstly, the post-necking behavior and failure of a low ductility Al-alloy are investigated. Low ductility alloys tend to fail brutally after reaching the maximum load. The major result is the capture of the sharp load drop which allowed to calibrate parameters of a GTN damage model. Secondly, the anisotropic elastic-plastic behavior of a “vintage” line pipe steel is characterized by a direct measurement of the Lankford coefficient. Assembled experimental data allowed to model the anisotropic plasticity in different loading directions.

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