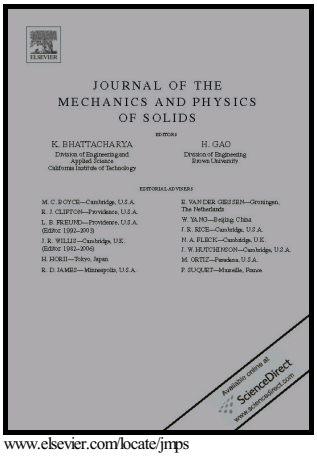

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On strain and damage interactions during tearing: 3D *in situ* measurements and simulations for a ductile alloy (AA2139-T3)

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Abstract

Strain and damage interactions during tearing of a ductile Al-alloy with high work hardening are assessed *in situ* and in 3D combining two recently developed experimental techniques, namely, synchrotron laminography and digital volume correlation. Digital volume correlation consists of registering 3D laminography images. Via simultaneous assessments of 3D strain and damage at a distance of 1-mm ahead of a notch root of a thin Compact Tension-like specimen, it is found that parallel crossing slant strained bands are active from the beginning of loading in a region where the crack will be slanted. These bands have an intermittent activity but are stable in space. Even at late stages of deformation strained bands can stop their activity highlighting the importance of plasticity on the failure process rather than damage softening. One void is followed over the loading history and seen to grow and orient along the slant strained band at very late stages of deformation. **Void growth and strain are quantified. Gurson-Tvergaard-Needleman-type simulations using damage nucleation for shear, which is based on the Lode parameter, are performed**

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