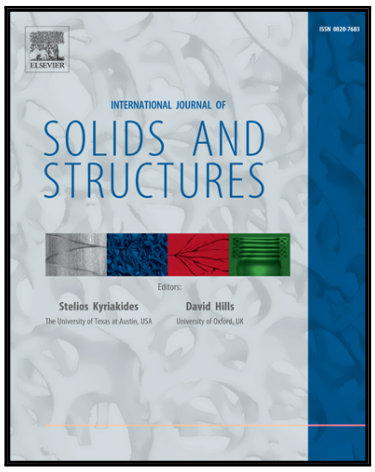

New biaxially loaded specimens for the analysis of damage and fracture in sheet metals

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New biaxially loaded specimens for the analysis of damage and fracture in sheet metals

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Abstract

The paper deals with development of new experiments based on performance of corresponding numerical simulations to study the effect of stress state on damage and fracture behavior of ductile metals. Different stress-state-dependent mechanisms of ductile damage acting on the micro-level are taken into account and, therefore, details of the stress state characterized by stress triaxiality and the Lode parameter in the critical parts of the specimens are of interest.

Based on detailed numerical analysis of standard cruciform specimens, newly designed specimens are developed and numerically studied. Specimens of the most promising geometries have been manufactured and tested. Strain fields in critical regions of the specimens have been evaluated by digital image correlation (DIC) technique and compared with the results of finite element simulations. Considering different biaxial loading conditions it is possible to cover a wide range of stress triaxialities and Lode parameters in tension, shear and compression domains and consequently the newly proposed specimens facilitate a controlled study of damage and fracture at different stress states. Experiments with these new specimen geometries are recommended for experimental programs to analyze safety and lifetime of metal structures.

Keywords: Biaxial experiments, new specimens, ductile damage and fracture, stress state dependence, sheet metals, digital image correlation

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