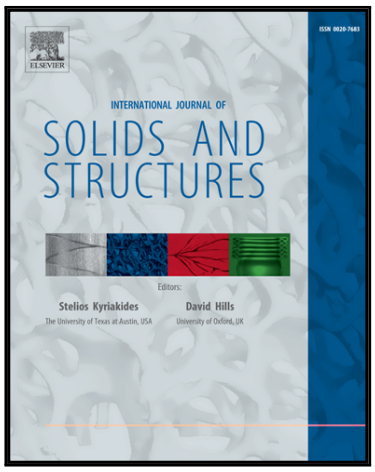

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STUDY ON THE EFFECT OF TENSION-COMPRESSION ASYMMETRY ON THE CYLINDRICAL CUP FORMING OF AN AA2090-T3 ALLOY

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Abstract

In this work, the Cazacu et al., (2006) is adopted to study the effect of the asymmetry between the tensile and the compressive plastic behavior in sheet metal forming. The example selected for this analysis is a cylindrical cup drawing, since it involves tensile and compressive stress states (Yoon et al., 2000). The material selected is the 2090-T3 aluminum alloy, since the experimental data available includes both tension and compression yield stress in-plane distributions (Barlat et al., 1991b), which allows the use of a classical strategy for the anisotropy parameters identification. Different sets of parameters are identified for the CPB06, taking or not into account the strength differential (SD) effect and, consequently, considering different sets of experimental data. All numerical simulations are performed with the DD3IMP fully implicit in-house code.

The results show that the earing profile is mainly dictated by the compression *r*-values in-plane directionalities, which are commonly unavailable for thin metallic sheets. The adoption of the CPB06 taking into account the tension-compression asymmetry, with an associated flow rule, enables the simultaneous prediction of both compression yield stress and *r*-values directionalities. The compression yield stresses directionalities seem to play a major role in the thickness prediction. Therefore, it is recommended the use of a yield criterion that is flexible enough to describe both the

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