Reverse loading parameter determination for ultra-thin steel sheets – COMPLAS XIII

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ABSTRACT

The determination of hardening parameters corresponding to reverse loading for ultra-thin steel sheets is very challenging since buckling easily occurs during this type of test. One of the possible methods to achieve this goal is to perform the three-point bend test of pre-strained specimens.The hardening parameters describing the Bauschinger effect, permanent softening and transient hardening behavior are determined from experimental and predicted springback profiles of these specimens using an inverse method.

In the present study, the springback for an ultra-thin ferritic stainless steel sheet sample is predicted with a finite element analysis. Various constitutive models are considered: isotropic von-Mises yield function and Yld2000-2d non-quadratic anisotropic yield functions; isotropic hardening (IH) and homogeneous anisotropic hardening (HAH); constant Young's modulus as well as modulus varying as a function of plastic strain are also considered. The yield function coefficients are calibrated with experimental data. The isotropic hardening and HAH hardening parameters are

calibrated using an inverse method by comparing the experimental and predicted springback profiles.

Among the different constitutive model combinations investigated in this study, the isotropic hardening (IH) model with consideration of modulus change (E_{var}) leads to the best predictions..In other words, the consideration of reverse loading behavior with anisotropic hardening does not seem to be relevantfor the modeling of this test with the presently studied material. It is also found that consideration of planar anisotropy described by Yld2000-2d provides a slightly better prediction compared to the isotropic von-Mises.

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