Uncoupled material model of ductile fracture with directional plasticity.

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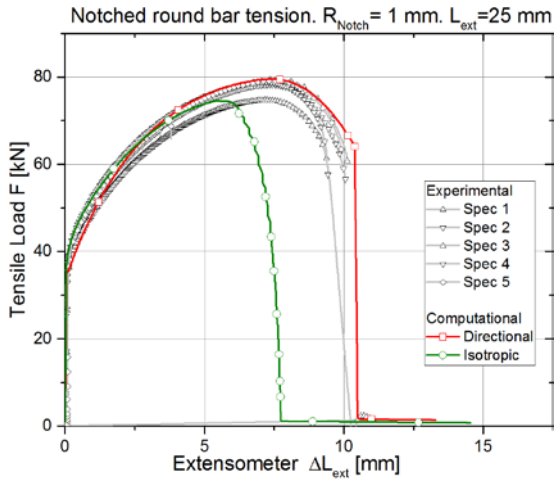
ABSTRACT

Modelling of ductile fracture in scope of damage mechanics is often performed with uncoupled constitutive models [1], as they are easily calibrated. These models are based on incremental calculation of damage (phenomenological scalar field). Damage increments are driven by increments of effective plastic strain while the plastic response is not influenced by the damage. Such approaches have been implemented in widely spread FEM packages as Abaqus, Ansys, etc. employing default plasticity models.

Proposed paper deals with the application of so called model of plastic response with directional distortional hardening (DDH, allow to control both position and shape of plastic surface) [2] in ductile fracture model described above and comparison of the results with the same ductile fracture model based on isotropic J2 plasticity. Calibration experiments using both smooth and notched round bars, small-punch test, and NT tension-torsion specimens of steel *08CH18N10T* had been performed in the past [3].



In our previous work we have found uncoupled models with standard plasticity acceptable except for the response of parts with higher stress concentration [3].

The results of simulations 1) have proven not negligible role of model of plasticity; 2) the response of the model with DDH plasticity is closer to reality then the one of the model with isotropic plasticity (calibrated with the same portfolio of specimens).

Using of DDH with uncoupled ductile fracture model may be an alternative approach to more expensive coupling damage with plasticity if improvement of prediction is needed.

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