3. Numerical investigation of square cup drawing

To illustrate some of the software capabilities, analysis of stamping process of an aluminum square cup is performed. Numerical results of stamping calculations is presented in Figs. 1 and 2. Comparison of the thickness strain distribution calculated by both analytical modules and experimental results is presented in Fig. 1. Results received by the module NUMPRESS-Explicit using planar and transversal anisotropy formulations are close to each other. Good agreement is seen between numerical and experimental results. For the square cup model on stamping depth 20 mm, we expect that we obtain failure because during experiments failure in specimen occur for the same depth. It is seen on the forming limit diagram presented in Fig. 2a. Strains marked by red color are close to forming limit curve, so we can take that such strains are in almost in failure zone. Such strains occurs in corners of the square cup (Fig. 2b).

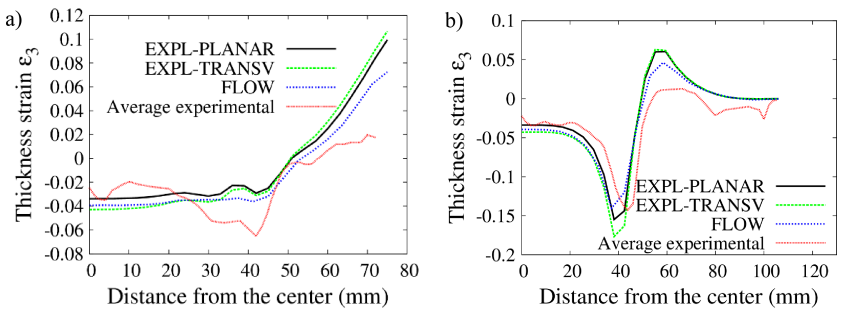

Fig. 1. Numerical results of thickness strain distribution in square cup specimen, stamping depth 15 mm, along the cross section: a) centerline, b) centerline rotated 45°.

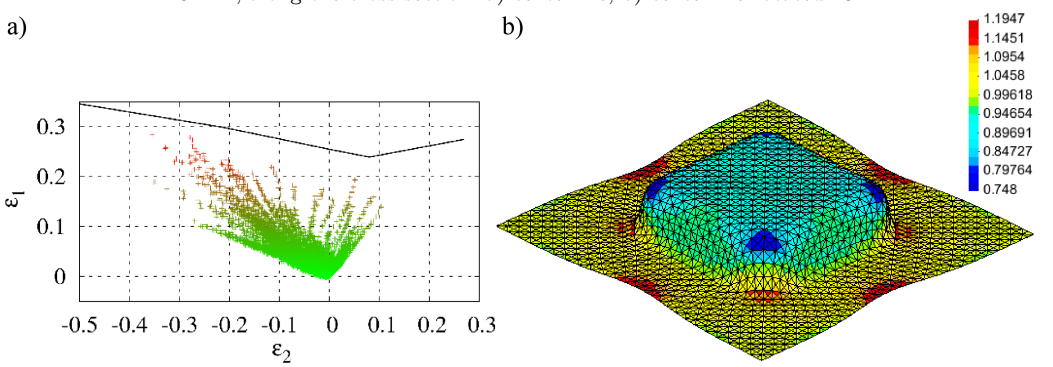

Fig. 2. Numerical results of strain distribution (a) in square cup specimen compared with experimental forming limit curve and thickness ratio (b), stamping depth 20 mm.

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