AN INFLUENCE OF STRAIN RATE AND ARTIFICIAL DEFECTS ON MATERIAL BEHAVIOUR DURING TENSION

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The components of machines should be designed in the manner that guaranties their successful application. In majority cases, they have complex shapes characterised by variable dimensions and appearance of notches or holes. Such forms of geometrical discontinuities influence stress levels leading to premature failure of the component, especially in the cases of stress components exceeding the ultimate tensile stress. The stress concentration factors are calculating [1, 2], and experiments on specimens with artificial defects are conducting [3, 4] in order to avoid such situations. This paper is devoted to analysis of an influence of artificial defects in the form of U-shaped notches and holes on tensile properties of aluminium using the 4M Aramis DIC system.

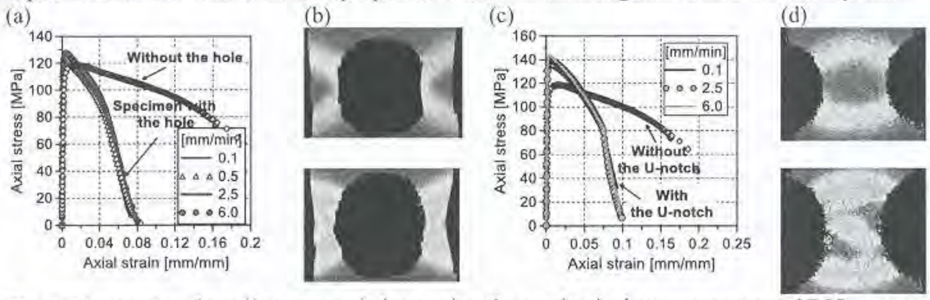

Fig. 1. The results of tensile tests carried out using the mechanical extensometer and DIC system: (a) and (c) - tensile characteristics determined for specimens with and without artificial defects; (b) and (d) – maps of the HMH equivalent strain distribution in specimens with holes and U-shaped notches, respectively, at two loading stages (close to yield point and close to fracture)

All tests were carried out at room temperature for selected values of strain rate using flat specimens with and without holes and U-shaped notches. Independently of the type of artificial defects considered, a variation of the yield point and ultimate tensile strength can be clearly observed, Fig. 1a, c. Almost 50% reduction of elongation was achieved for specimens with artificial defects. Full-field maps of the Huber-Mises-Hencky equivalent strain distribution are elaborated, Fig. 1 b, c.

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