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Inverse modeling procedure for post-necking hardening behavior of commercial pure titanium sheet and its evaluation

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ABSTRACT

The identification of the post-necking strain hardening behavior of metal sheet is important for finite element analysis procedures of sheet metal forming process. Inverse modeling methods are widely used for the determination process. This study is thus focused on the evaluation of the inverse modeling method using a novel material performance test. Hot uniaxial tensile test of a commercially pure titanium sheet with rectangular section was first conducted. Utilizing the raw data from the tensile test, the post-necking hardening behavior of the material is determined by a FE-based inverse modeling procedure. In order to verify the accuracy of the inverse method, biaxial tensile test at elevated temperature was performed using a special designed cruciform specimen. The cruciform specimen could guarantee uniform plastic deformation of the material to very large strains. Finally, the stress–strain curves obtained from the two experiments are compared and analysis studies are provided.

KEYWORDS: inverse modeling, post-necking hardening, biaxial tensile test, commercial pure titanium