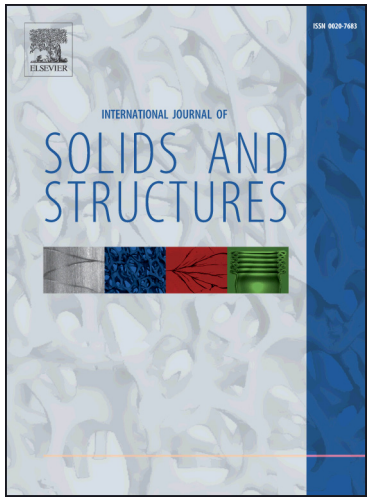

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Identification of Post-Necking Strain Hardening Behavior of Thin Sheet Metals from Image-Based Surface Strain Data in Uniaxial Tension Tests

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Abstract

A local correction factor method is proposed for identifying the post-necking strain hardening behavior of a thin flat sheet metal under uniaxial tension testing. Based on local surface strain measurements of a flat tension test coupon containing a developing diffuse neck by digital image correlation and the axial force balance at the necking cross-section, the method extends the classical Bridgman approach to thin sheet metals with non-symmetric and irregular necking morphologies and with a general non-quadratic anisotropic flow function. The new method is shown by numerical simulations to be able to obtain reliable post-necking true stress-strain data at large strains up to the onset of localized necking with a multi-linear strain hardening model. It has been successfully applied to extract post-necking true stress-strain curves from three standard flat tension test coupons made of AISI 1018 low carbon steel, C260 Cu-Zn brass, and AA5052-H32 Al-Mg aluminum alloy thin sheet metals respectively. The local correction factor method is relatively simple to use in comparison with many other methods appeared in the literature and it can more readily be implemented as part of a routine data analysis in image-based uniaxial tension testing of sheet metals.

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