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Lüders-type deformation of Ti-25Nb shape memory alloy in tension inspected by digital image correlation and infrared thermography

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This work is focused on the thermomechanical characterization of Ti-25Nb shape memory alloy (SMA) under loadunload tension at the strain rate of $2 \cdot 10^{-2}$ s^{-1} using synchronized techniques of 2D digital image correlation (DIC) and infrared thermography (IRT). The Ti-25Nb SMA was fabricated using a route described in [1] and a specimen with gage part with dimensions 6 mm x 4 mm x 0.5 mm was prepared. The experimental methodology applied in this study was previously discussed in [2, 3]. During the tension process, the development of macroscopic martensite bands in the Ti-25Nb SMA, associated with the stress-induced phase transformation from β to α", was clearly observed in deformation as well as temperature fields. Global and local mechanical and thermal characteristics of the Lüders-type deformation of Ti-25Nb SMA were compared. It was found that local maximum values of strain rate were even over 7 times higher than those of global strain rate, whereas the maximum temperature change was 8.7 K at critical stages of tensile loading.

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