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PROGRAM and ABSTRACTS

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Investigation of TiNi Shape Memory Alloy, Polymer and TiNb Ni-free High Elastic Alloys by using Digital Image Correlation, Infrared and Acoustic Emission Techniques

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The goal of the research was to compare and discuss the behavior of new multifunctional materials under cyclic loading conditions. To this end, the TiNi SMA produced by Furukawa [1], the Gum Metal provided by the Toyota Central Research & Development Labs, Japan, as well as the Shape Memory Epoxy 3D-printed at the Technical University of Madrid [2], were subjected to loading on a smart Instron Testing Machine. For the Ti-based alloys, stress-induced martensite/reverse transformations that nucleate and develop during the loading process were analyzed based on the obtained mechanical, infrared (IR) and acoustic emission (AE) data. The digital image correlation (DIC) system with its own algorithm was used. The fast and sensitive Infrared Camera Phoenix Flir Co. evaluated the temperature changes during the deformation process. The obtained experimental data (an example is presented in Fig. 1), correlated with the microstructure of the materials, expand our understanding of these novel materials and provide valuable input for modeling.

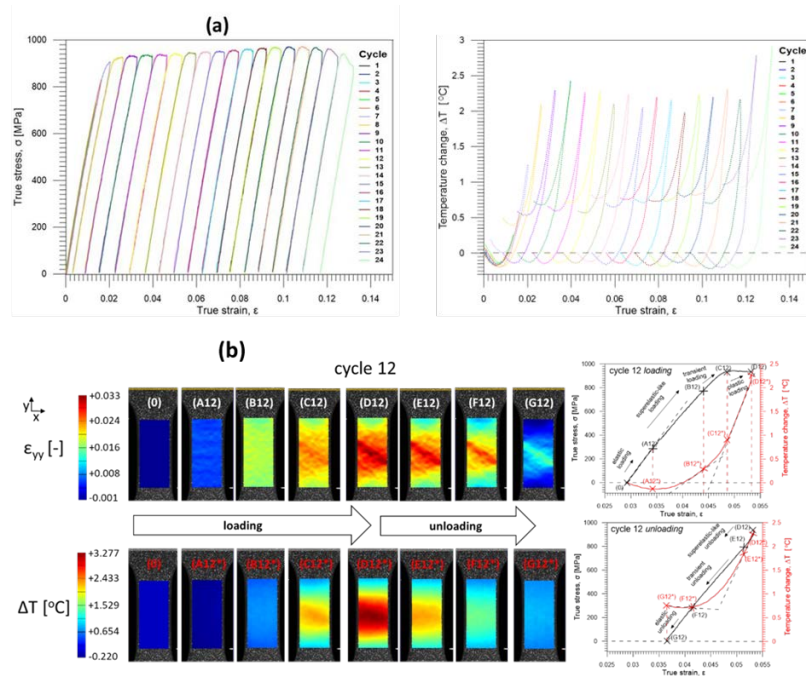


Fig. 1. (a) Stress σ vs. strain ϵ curves and the related average temperature change ΔT vs. strain ϵ curves obtained for Gum Metal under loading-unloading 1-24 tensile cycles.

(b) Evolution of strain ϵ_{yy} obtained by DIC and temperature ΔT fields obtained by IRT of Gum Metal specimen at selected stages of loading-unloading cycle No. 12 [3].

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