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Influence of thermo mechanical pre-treatment on efficiency and temperature stability of shape memory alloys

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Abstract

The functional “programming” of one SMA-component is of substantial interest in the case of actuator applications regarding standardisation of components and integration of component parts. For the programming of components it is necessary to make a thermo mechanical pre-treatment. This treatment influences not only the effect characteristic and the transformation temperatures, but also characteristics such as the efficiency and temperature stability.

In order to study the influence of the thermo mechanical pre-treatment on the efficiency and temperature stability, wires of high-nickel pseudoelastic and low-nickel pseudoplastic alloys under change of various parameters were functionally characterised in the present study. In this context, tension tests and temperature-controlled heating tests were carried out. A test stand was developed especially for the heating tests. The heating tests were implemented to determine the one-way effect properties, such as the transformation temperatures, hysteresis, the irreversible strains etc. and also to determine the short-time and permanent temperature stabilities. In addition, the tests were carried out with different loads. Particularly the high-nickel alloys showed a very large potential. Beyond the well-known pseudoelastic applications by defined pre-treatment they can also be used as actuators.