

Dr. Burkhard Maaß

Managing Director

Ingpuls GmbH



Customization of NiTi(X,Y) shape memory alloys for elastocaloric applications

Today, Shape Memory Alloys based on Nickel Titanium are mostly used for superelastic applications in medical devices. Another known area of applications are actuator systems, using the shape memory effect. The emerging field of elastocalorics combines many of the requirements of both existing technologies. With the potential of both helping to make cooling and heating more sustainable and at the same time multiplying the world's market of Shape Memory alloy production, it is a very interesting field to be active in as an SMA producer. While tube and wire are the most used semi-finished products in medical devices, wire and compression springs represent a major part of actuator components. For elastocalorics, it is not yet clear which geometry will prevail.

Systems based on tension, compression and torsion have been presented by the community, each with its own merits but also disadvantages. What all have in common is that most prototype systems are built with available, off the shelf material for medical applications. What all also have in common is that this material is not really the best fit for Elastocalorics, and thus, the need of customized Shape Memory Alloys. Hysteresis, material's COP (Coefficient of performance) and cyclic stability are among the most important requirements. For cascaded systems, also precisely controlled alloy-variations with close sequences of changing A_f -temperatures.

In this work, we present our recent results on the processing, training and characterization of binary and quaternary alloys, wire, and sheet/ribbon for elastocaloric applications.