

Niti shape memory alloy energy storage



Overview

Motivated by the recent advancements demonstrating the effectiveness of NiTi shape memory alloys (SMAs) as high figure of merit (FOM) phase change materials (PCMs) for thermal management and storage.

Are NiTi shape memory alloys a good PCM?

Motivated by the recent advancements demonstrating the effectiveness of NiTi shape memory alloys (SMAs) as high figure of merit (FOM) phase change materials (PCMs) for thermal management and storage, NiTiHf SMAs were explored as candidate solid-solid PCMs with high temperature capability.

Are NiTi shape memory alloys a promising material for orthopedic applications?

NiTi shape memory alloys, promising materials in orthopedic applications. In Shape Memory Alloys—Processing, Characterization and Applications, InTech: New York, NY, USA, pp. 261–278. Eichler, A. S. (2020).

Can NiTi-based shape memory alloys be used in solid-state refrigeration?

Many established, but also potential future applications of NiTi-based shape memory alloys (SMA) in biomedical devices and solid-state refrigeration require long fatigue life with 10^7 – 10^9 duty cycles 1, 2. However, improving the fatigue resistance of NiTi often compromises other mechanical and functional properties 3, 4.

What are the future applications of NiTi-based shape memory alloys (SMA)?

Provided by the Springer Nature SharedIt content-sharing initiative Many established, but also potential future applications of NiTi-based shape memory alloys (SMA) in biomedical devices and solid-state refrigeration require long fatigue life with 10^7 – 10^9 duty cycles^{1,2}.

Does NiTi have a shape memory effect?

Through a comparative analysis of NiTi, the Shape Memory Effect (SME) was examined considering its unique properties and composition within various

engineering contexts. The investigation further delves into the influences of microstructure, composition, formation, and cyclic application on the behaviour of NiTi.

How do NiTi shape memory alloys improve ductility?

Using laser powder bed fusion and a tailored heat treatment, the authors produce NiTi shape memory alloys with improved strength, ductility, and superelasticity enabled by high-density of Ni-rich local chemical inhomogeneity entities.

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Microstructure and Phase Transformation Behavior of NiTiCu Shape Memory

NiTiCu thin walls were produced by twin-wire arc additive manufacturing (T-WAAM) using commercial NiTi and Cu wires as the feedstock materials. This approach aims to ...

NiTi shape memory alloy: Unraveling the role of internal friction in

The control of TT and shape memory behaviour in binary NiTi alloys can be effectively achieved by manipulating the Ni concentration. This is primarily attributed to the ...



Transformation pattern of shape-memory NiTi alloy during stress ...

Despite the superelastic deformation of NiTi has been documented and analyzed elaborately, its shape-memory behavior during stress-biased thermal cycling has not been ...

Achieving the higher strength, larger recoverable strain and

To further optimize the comprehensive performances of NiTi based shape memory

alloys, various ternary or quaternary NiTi shape memory alloys have been developed. ...



Nanocomposite NiTi shape memory alloy with high ...

Increasing the fatigue life of shape memory alloys often compromises other mechanical properties such as yield strength and plastic ...

Fabrication, mechanical properties and damping capacity of shape memory

A novel Shape Memory Alloy NiTi fiber-reinforced metal-intermetallic-laminate (SMAFR-MIL) composite with a volume fraction of ~ 3.5% NiTi was fabricated using vacuum ...



NiTiCu shape memory alloys with ultra-low phase transformation ...

Shape memory alloys (SMAs) have been demonstrated as effective phase change materials (PCMs) for thermal energy storage (TES) applications. NiTi and NiTiHf SMAs ...

Negative grain boundary excess entropy in NiTi shape memory alloy

Atomistic calculations of free energy were performed for several symmetric tilt grain boundaries over a wide temperature range in the shape memory alloy NiTi. Contrary to expectation in a ...

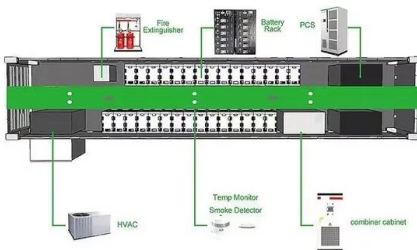


Welding and Joining of NiTi Shape Memory Alloys: A Review

Shape memory alloys are functional materials that present two very distinct properties: superelasticity and shape memory effect. Among these alloys, NiTi is the most ...

Microstructure, Thermal, and Mechanical Behavior of NiTi Shape Memory

This study investigates the impact of AM processing on the shape memory properties of NiTi alloys using the Micro Wire and Arc Directed Energy Deposition (u-WA-DED) ...



Hydrogen-resistant materials: A review exploring shape memory alloys

It is rare but essential to have materials with high strength, superelasticity and shape memory capacity, due to the constant need to manage safety-critical operations in both ...

Enhancing shape memory properties of 3D-printed NiTi alloys by ...

Near-equiatomic NiTi alloys have great potential for application in aerospace and biomedical fields due to their exceptional shape memory performance and superelasticity. ...



Energy damping in shape memory alloys: A review

The shape memory response and associated damping quality are discussed for three popular families of SMAs; Fe-based, Cu-based, and NiTi-based alloys including their ...

Advancing engineering frontiers with NiTi shape memory alloys: A

Abstract This study provides a comprehensive review of the observation of NiTi Shape Memory Alloys (SMAs) in engineering applications and beyond.



Thermal storage properties of NiTiCu shape memory alloys with ...

In this article, two different systems of NiTiCu shape memory alloys are explored, and the phase transition behavior and thermal storage properties of the alloys are investigated.

NiTi smart alloys in electronic and electrical equipment

As the fabrication process of NiTi shape-memory alloy holds a dominate criteria in the application, various steps of the fabrication technique needs to be explored in detail. There ...



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Cite this article: CHEN Fei, QIU Pengcheng, LIU Yang, SUN Bingbing, ZHAO Haisheng, SHEN Qiang. Microstructure and Mechanical Properties of NiTi Shape Memory Alloys by In Situ Laser ...

High-Superelasticity NiTi Shape Memory Alloy by Directed Energy

NiTi shape memory alloy with near equal atomic ratio exhibits excellent shape memory effect and superelasticity [1], good biocompatibility [2, 3], corrosion resistance [4] and ...



Latent heat storage capacity of NiTi shape memory alloy

Abstract The largest amount of latent heat of the martensitic transformation in nickel titanium shape memory alloy was explored. The measured amounts of ...

NiTi-Based Shape Memory Alloys , SpringerLink

Shape memory alloys have become a remarkable material class after the discovery of the shape memory effect in NiTi alloy in 1963. Today, nitinol (NiTi) is the most ...



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Two-step strain glass transition in NiTi shape memory alloy with ...

The emerging ferroic glassy state in shape memory alloys (SMAs), termed strain glass, undergoes a freezing process characterized by frustrated short-range strain order with ...

Functional properties of NiTi shape memory alloys and their

As a sort of intelligent material, NiTi shape memory alloys (SMAs) are widely used in the fields of aerospace, medical devices and construction due to their functional properties such as ...

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Microstructure, Thermal, and Mechanical Behavior of ...

This study investigates the impact of AM processing on the shape memory properties of NiTi alloys using the Micro Wire and Arc Directed ...

Two-step strain glass transition in NiTi shape memory ...

The emerging ferroic glassy state in shape memory alloys (SMAs), termed strain glass, undergoes a freezing process characterized by ...



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Grain growth-induced thermal property enhancement of NiTi shape memory

Abstract We interrogate the extent to which grain size plays a role in augmenting the thermal conductivity and thermal energy storage capacity of a NiTi shape memory alloy (SMA) using ...

Machine-Learning-Driven Design of High-Elastocaloric ...

In recent years, the detrimental impact of traditional gas-liquid refrigerants on the environment has prompted a shift towards sustainable solid ...



Application scenarios of energy storage battery products



Microstructures and mechanical properties of NiTi shape memory ...

In this study, five layers of NiTi alloy were deposited by the cold metal transfer welding (CMT) based WAAM process using Ni 50.8Ti wires as the feedstock material.

NiTi shape memory alloys: properties

The more complete the martensitic phase transformation that occurs in NiTi alloys, the more desirable is the shape memory, however it results in a shorter fatigue life.



Grain growth-induced thermal property enhancement of NiTi

...

are Thermalconductivity Thermoreflectance
 Shape memory alloy Latent heat Thermal
 storage contrary to the
 performancemetricsachievedusingconventional
 mechanismsthatimprove PCM

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