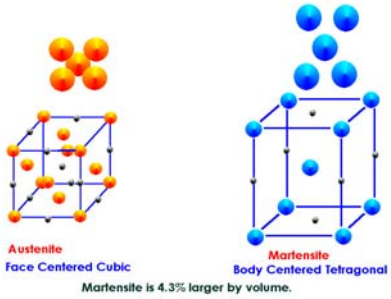
SHAPE MEMORY ALLOY (SMA)

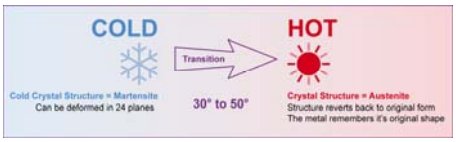
Introduction

A shape memory alloy(SMA) is a material that has the ability to return to its previous shape after being deformed(bent) by applying heat or in some cases just releasing the stress.

- In order to understand the way in which the shape memory effect occurs it is useful to understand the crystal structure of a SMA.
- All shape memory alloys exhibit two very distinct crystal structures. Which phase is present depends on the temperature and the amount of stress being applied to the SMA.
- These phases as known as martensite which exists at lower temperatures and austenite for higher temperatures.
- The properties of an SMA depends on which the amount of each crystal phase present.



- One type of shape memory alloy is Nitinol, which is short for Nickel Titanium Naval Ordnance Laboratory and which acknowledges the site of its discovery in 1965
- Nitinol is an alloy of about 56 % Nickel and 44 % Titanium.
- Nitinol “remembers” its original shape and springs back up to temperatures up to 500 degrees C. Can be strained 8 to 10 times more than spring steel without permanent deformation. Won’t kink. Coils easily.



- Ex.: Ni (49%)-Ti (51%) (nitinol), Au-Cd, Cu-Zn-Al-Ni
- good mechanical properties: strong
- corrosion resistant
- bio-compatible

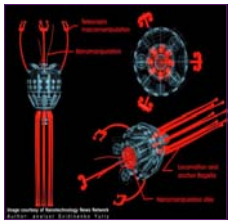
Application

- Aircraft Maneuverability
- Surgical tools
- Robotic Muscles

Application

A detector for fire alarm sprinkler system.

When there is a fire the temperature will affect the electrical circuit and trigger the sprinkler.



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