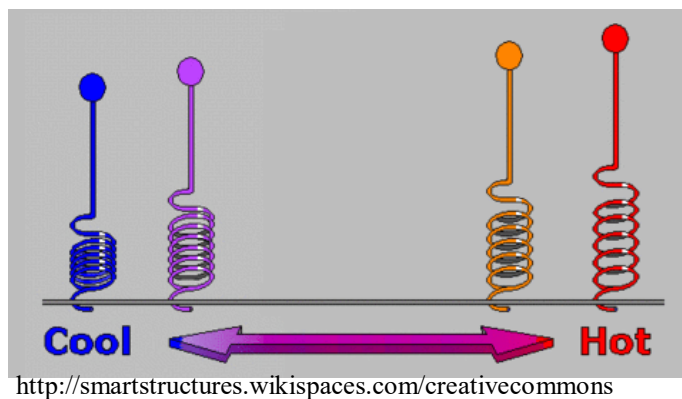


SENIC—Nanoscale Science and Engineering

Exploring Shape Memory Alloys

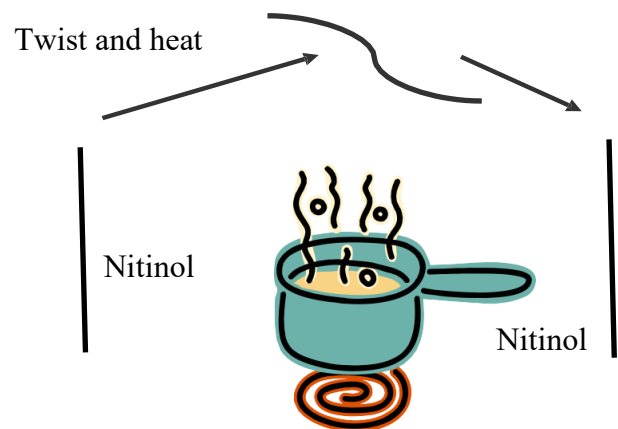
Explore!

1. Take a piece of copper or aluminum wire.
2. Twist your wire and then drop it in the hot water. What happens?
3. Next take the other wire, twist it, and drop it in the hot water. WATCH!
4. What happens?
5. Do you want to do it again?



What is a Shape Memory Alloy?

Shape memory alloys are a class of materials also referred to as smart materials. These smart materials can “think” and do amazing things. The one featured here is a metal called nitinol (**N**ickel **T**itanium **N**aval **O**rdinance **L**ab) made up of nickel and titanium atoms.



Nitinol is unique because it has two different crystal structures that change phase (in the solid state) at a distinct temperature. When it is below the “transition temperature,” it can be stretched and transformed without permanent damage. After the alloy has been reshaped or stretched and heated above its transition temperature, the alloy “recovers” and returns to the unstretched shape.

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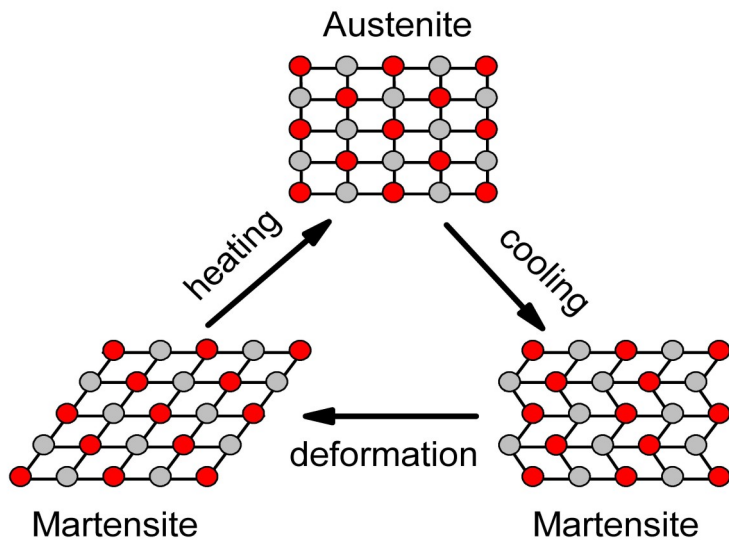


Image at: http://en.wikipedia.org/wiki/Nickel_titanium

Crystal structures of the atoms of nitinol -

1. **Martensite**: cool form that bends easily
2. **Austenite**: warm, rigid form.

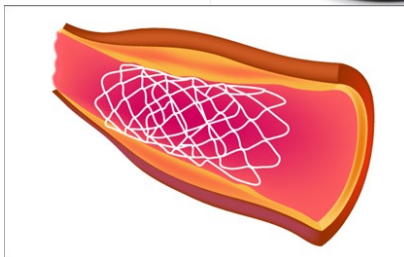
Heat supplies energy to the atoms to move within the structure - solid state phase transformation.

Applications:

Coffee Pots



Braces



Stents



Eyeglass frames

Surgical instruments

