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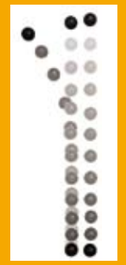

Memory Wire

Memory Wire

This amazing "MEMORY WIRE" is a special alloy of Nickel and Titanium. The wire can be bent by fingers into any shape and, when warmed to about 60°C, this amazing wire immediately springs back to its original shape.

MEMORY EXPERIMENT:

- Take the MEMORY WIRE and bend it in one or several places so that it is no longer the original shape.
- Take a glass or plastic vessel and fill it with hot water from the tap. This temperature should be about 70°C.
- Plunge the wire into the hot water. The wire should spring back almost instantly to its original shape.
- Try different temperatures of water to determine the exact temperature that causes the triggering of the crystalline structures.

CAUTION: The wire returns to its original shape very quickly. Take care not to be scratched by the wire and keep away from face and eyes.

What is an "ALLOY"?

An alloy is a combination of two or more different base materials which, when mixed, forms a material which may have properties which are quite different from the original materials. Metals are very commonly alloyed and plastics too are being alloyed to try to improve the various properties of individual types.

Examples of alloys:

- Brass is an alloy of copper and zinc. Brass has the stiffness and strength because the zinc and has low electrical resistance because of the copper.
- Bronze is an alloy of copper and tin. Bronze has the hardness of tin added to the low electrical resistance of copper. It is more resistant to corrosion than copper. With a small amount of phosphorus added it becomes very springy.
- Solder is an alloy of lead and tin. The tin content raises the melting point of the lead to form high temperature solder that flows much better than lead.
- Stainless Steel is an alloy of iron, nickel and chromium. It resists corrosion and there are many forms of stainless steel used for various purposes depending on the alloy proportions used.
- Steels are available in many different forms suitable for welding, hardening, tool making, machining, rolling into sheets and so on. Each type is a different alloy sometimes adding very small amounts of lead, manganese, chromium, nickel or other materials.
- Magnets are special alloys, usually containing cobalt, that allows the material to retain magnetic strength.

The MEMORY WIRE can be 'trained' to have a different initial shape.
To re-train the wire, bend it to a new shape and hold it into this shape with pliers while heating it in a flame. Heat it to a red hot temperature, cool for a few moments, then plunge it into cold water.
This shape is now its new 'original shape'. Now bend it again and plunge it into 60°C water. It should spring back to the new shape immediately.

Further information on why MEMORY METAL 'remembers' shapes:

The secret to this amazing alloy is its crystalline structure. This is an ordered internal structure formed by the repetition of millions of crystal units. Each crystal has characteristic shape and angles.

Normal metal alloys have an internal structure which is not altered by small temperature changes. Heating causes the atoms of the metal to vibrate faster and this makes the metal easier to bend when an external force is applied. The molecular form of the metal is not normally altered by heating, but in MEMORY METALS, there are two stable crystalline structures. When a temperature change occurs, a triggering from one crystalline form to the other occurs and the critical temperature at which this occurs depends on the careful choice of metals and the exact proportions used in the creation of the alloy.

By changing the alloy content and proportion, the critical temperature can be altered from 23°C below zero up to 100°C. Other lower cost MEMORY ALLOYS have been made using Copper, Zinc, Aluminium and other trace metals (extremely small quantities). This brass memory alloy has low cost and great strength.

Practical Applications of MEMORY METALS:

- *In Biomedicine:* Stents and various other devices need to have a special shape but must be very small when placed into position in a vein or organ. Items made from a memory metal can be collapsed and inserted into the body so that when they are heated by the body or from an external source, they spring out to the designed shape. Stronger sections have been used in spines and joints to support and reinforce.
- *In Space:* Devices such as antennae can be sent into space by first being bent to take up very little space but, when in orbit and warmed by the sun, they spring open to take up their larger design shape.
- *Repairing pipes:* Bands of MEMORY ALLOY can be made and used to reinforce pipes or to cover leaks in pipes in areas where there is no access to repair the problem. They can be heated to the correct temperature to spring down to clamp tightly around the pipe.

Can you think of additional uses for this amazing metal ?

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