



Nitinol - Alloy Ni/Ti with Memory

Nitinol is a metal alloy, sometimes known as “*memory metal*” but more properly as *Shape Memory Alloy* (SMA). The memory effect in metals was discovered in the 1930’s, but Nitinol itself was only discovered in 1962. Made from Nickel and Titanium, it was discovered at the Naval Ordnance Laboratory in White Oak, Maryland.

The variations in physical properties are caused by a variation in heat. When the temperature of the metal is below a certain critical temperature, the alloy is flexible and can be easily bent into shapes. This is caused by the atoms in the crystal structure forming in flexible lattices.

Once heated to the critical temperature, Nitinol displays its heat memory as it transforms into its original state, where the atoms become locked into their previous rigid arrangement. When the metal springs into its remembered shape, it does so with so much force that it can be used to do actual work. Small motors have been built using Nitinol wire that passes through different temperatures. Solar panels on some satellites are raised into position by Shape Memory Alloys, activated by the heat of the sun.

A shape is programmed into a piece of Nitinol by annealing it. The metal is held in the desired shape, and heated to a high temperature. After it cools, you can bend it into any shape you want, but heat it above the critical temperature and it will instantly return to the high temperature shape that you programmed into it.