

PROBLEM

Determine the Transformation Temperature for a sample of a shape memory metal.

METHOD

The preceding investigations should have given your students a good understanding of what memory metals are and basically how they “work”. As they did the investigations, they may have thought about the conditions that caused these phase changes to take place. Pose the following question: “What is the transition temperature range for your sample of NiTi?” Say very little in the way of how they should proceed, but the following provides an outline of procedures that might be used.

- A.
 - 1. Using a thermometer clamp or 1-hole stopper, suspend a thermometer in a 400 mL beaker that is 2/3 full of water, and set the beaker atop a hot plate.
 - 2. Bend a piece of NiTi wire and suspend it from the clamp that is holding the thermometer in the water bath. Take care that the bend in the wire and bulb of the thermometer are next to one another.
 - 3. With constant stirring, slowly warm the water and note the temperature at which the wire returns to its original shape.
- B. Utilize the same procedure as Investigation 5.
- C. Hang a weight on the wire and monitor its deformation and shape recovery simultaneously as the material is cooled and heated through the transformation range. The idealized figure below shows the elongation and contraction of shape memory wire under tensile loading as the temperature is lowered and then subsequently raised.

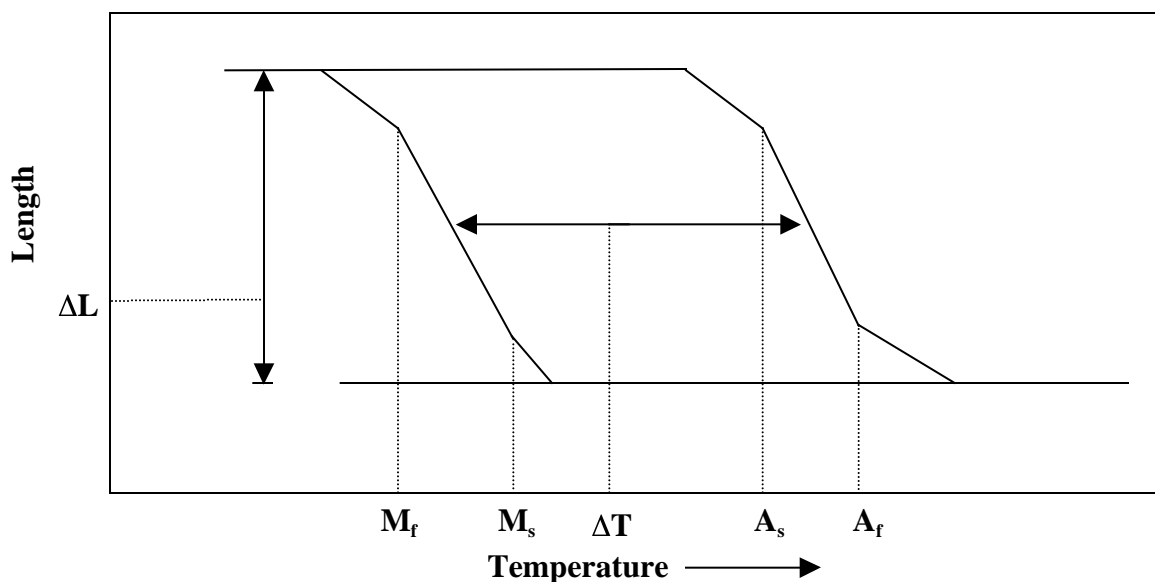


Figure 4: From “Shape Memory Effect” at <http://www.aem.umn.edu/people/others/hane/shape.memory.html>