

## **PURPOSE**

To allow students to investigate NiTi memory wire.

## **METHOD**

You should allow students adequate time both to follow the instructions as outlined on page 18 of the “Exploring the Nanoworld” guide and to experiment freely with other ideas that come to mind as they ponder what they have observed. Encourage them to write down not only their observations, but also questions that arose as they completed the activity. See the sample lesson plan for recommended time allocations.

## **MATERIALS**

Samples of NiTi wire either from the “Exploring the Nanoworld” kit or from the suppliers listed in the appendix.

400 mL beaker

hot plate or Bunsen burner (you may want to pre-heat the water in a coffee pot, in which case these are not necessary).

ringstand, ring, and wire gauze, if burner is used.

## **PROCEDURE**

- a. Observe the piece of wire that has been provided by your instructor. Note its outward characteristics, especially its shape. (Draw its initial shape in your notebook.) Fill a 400 mL beaker 2/3 full of tap water and place it on a wire screen on a ring stand or a hot plate as directed by your instructor. NOTE: Your instructor may provide you with hot water.
- b. Make several coils in the wire by wrapping it around your pencil several times.
- c. If you are to heat water, place the wire into the beaker and begin slowly heating the water while carefully observing the wire. Stop heating after any significant changes to the wire have been observed.
- d. Record your observations.

## **ANSWERS TO FOLLOW-UP QUESTIONS**

1. List your observations before and after deforming the wire. Also list your observations as you heated the wire. Specifically, what happened when the deformed wire was exposed to hot water?

**Wire returns to its original shape. Note: Be sure to include in a post-investigation discussion the difference between an observation and an inference/interpretation.**

2. What questions came to mind as you performed this experiment? Invariably, good observations lead to many questions; recall what being a good observer entails.

**Student responses will vary and should probably be collected and recorded during a class discussion. They may include:**

- 1) **Why did this happen?**
- 2) **How did this happen?**
- 3) **Do all metals do this? If not, why is this one special?**
- 4) **Does the temperature of the water make any difference?**
- 5) **Does the length or diameter of the wire matter?**
- 6) **What uses could metals of this nature have?**

**You may want to demonstrate with a paper clip for comparison. A simultaneous demonstration with multiple pieces of wire is also quite dramatic!**

3. Why do you think these wires fall into a category called “smart materials”?

**Because they “remember” their original shapes and respond to changes in their environment.**

4. What possible uses could materials similar to these have?

**Student responses will vary, but this should lead to a lively and entertaining class discussion. This should also be viewed as an opportunity for you to encourage the class to design experiments to answer some of their previous questions with further investigation.**