



Concept:

Thermal expansion results from a change in the average separation distance between atoms as a material changes temperature. As the temperature of a material is increased, so does the amplitude of its atomic oscillations and average inter-atomic distances.

Brass has a thermal expansion coefficient approximately twice as great as steel. Thus, brass will experience a greater expansion in its length than steel will for equal temperature changes. A bimetallic strip of steel and brass will thus bend toward the steel upon heating and toward the brass upon cooling.

Procedure:

1. Show that the bimetal strip is straight at room temperature.
2. Light the Bunsen burner with the spark lighter and hold the bimetal strip over the flame for a few seconds.
3. Show that the bimetal strip bends to the side with the steel.
4. Fill the small dewar flask with liquid nitrogen and dip the bimetal strip in for a few seconds.
5. Show that the bimetal strip bends to the side with the brass.

Notes and Extras:

- Thermal Expansion Coefficients (fractional expansion per °C)
 - Brass $\Rightarrow 19 \times 10^{-6}$
 - Steel $\Rightarrow 11 \times 10^{-6}$

Equipment:

- Metal Tray
- Liquid Nitrogen in Dewar
- Small Dewar Flask
- Bimetal Strip
- Bunsen Burner and Propane
- Spark Lighter