

# Thermal Conductivity with Liquid Crystals

## Introduction

In this activity we will explore the thermal conductivity of different types of materials using physical touch and liquid crystal thermometers.

## Material

Pieces of scrap metal, plastic, wood and styrofoam

Liquid crystal thermal post cards

Beaker or large cup

Hot water

Spray Adhesive

## To Do and Notice

Pick up each piece of material and feel the surface with your fingertips. Does the material feel room temperature, or cold to the touch? Arrange the pieces of scrap metal, plastic and styrofoam in order on the table from warm to cold to the touch.

Cut the liquid crystal thermal postcard in strips to fit on one surface of each piece of material. Use spray adhesive to attach a strip of thermal post card to each material. Now place the materials in a beaker of hot water with one end submerged and the other end sticking up several inches from the rim. Observe the color change of the thermal postcard as the materials conduct heat. The color of the thermal postcard changes in order from black to red, to yellow, to green, to blue and back to black again with an increase in temperature. Compare the speed at which the liquid crystal changes color from the hot end to the cold end for each material. Does the spacing between the colors in the liquid crystal vary for each material?

## What's Going On?

Most plastics and styrofoams are thermal insulators; they should feel room temperature to the touch. Metals are good thermal conductors. Metals conduct heat away from your fingertips, so they should feel cold to the touch. As heat flows from your fingers to the strip of metal, the temperature of the metal will increase absorbing heat from the tip of your fingers. This gives you a cold sensation.

Conduction is heat transfer by vibration of molecules. An increase in temperature on one end of the material causes the molecules in that end to vibrate, which then cause the neighboring molecules to vibrate, and so on, eventually reaching the other end of the material.