



WAYNE STATE
UNIVERSITY

LESSON PLAN

LIQUID CRYSTALS: THE CHEMISTRY BEHIND MOOD RINGS AND IPHONE SCREENS

SUBJECT AREA: CHEMISTRY, PHYSICS AND MATERIALS SCIENCE

DESCRIPTION: Students will use liquid crystal temperature sensors to image hidden objects.

LESSON OBJECTIVES: Use basic principles in chemistry, physics and materials science to create a liquid crystal display. Students will take knowledge from application and discuss new uses for liquid crystal sensors.

MATERIALS/SUPPLIES:

- 4-inch-by-6-inch liquid crystal sheet (available on Amazon or [teachersource.com](https://www.teachersource.com))
- 1-2 disposable hand warmers
- 3 envelopes featuring hidden objects on the inside and clues written on the outside (items could be refrigerator magnets cut into specific shapes, coins, keys, etc.)
- Mood rings to take home (optional)

ACTIVITY PROCEDURES:

1. Have students break up into groups of two to four. Provide each group with a kit.
2. Have students press the palm of their hand on a flat surface, like a desk or table. Ask if they are able to see anything when they lift up their hand.
3. Instruct students to use the liquid crystal sheets to image the latent heat of their handprints, focusing on how the colors fade upon cooling. Take note of the colors and in what order they disappear.
4. Have students heat up the items in the envelopes with the disposable hand warmers, then gently press the envelopes against the liquid crystal sheets. Students should use the clues on each envelope to solve the mystery of what is inside.

DISCUSSION AREA AND QUESTIONS:

- Two properties of liquid crystals make them ideal sensors: the sensitivity to changes in their surroundings, and visual effects. Because of these properties, we can use liquid crystal sensors to see what our eyes can't.
- What colors disappeared first when the liquid crystals cooled? How does this compare to the refraction of sunlight?
- How were you able to guess what was inside the envelopes?
- This activity uses thermochromic material (liquid crystal sheets). Can you give any examples of other objects or materials that are thermochromic? (Dyes and paints, thermometers, security cameras, cosmetics, etc.)
- Some liquid crystals can measure temperature, while others can sense movement, pressure, chemicals and electricity. Brainstorm some potential inventions that could use liquid crystal sensors.

ADDITIONAL VIDEO CONTENT:

Liquid Crystals — Chalk Talk: youtu.be/nAjgchCI3kg

Adapted from Stephanie Brock, WSU Department of Chemistry