

# TLC Dot Stickers

## Thermochromic Liquid Crystal Dot Stickers

### TLC Dot Sticker Facts

TLC Dot Stickers are first colored black. Next, the dots are coated with thermochromic liquid crystals (TLC). Thermochromic means to change color in response to a temperature change.

### TLC Dot Sticker Challenges

1. What effect does heat have on the color of TLC Dot Stickers?
2. What effect does cooling a heated TLC Dot Sticker have on the color of the sticker?

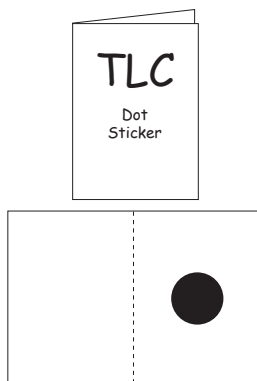
### Materials

- 1 Janice VanCleave TLC Dot Sticker
- 1 white, unlined index card
- 1 ice cube

### Make a Storage Foldable

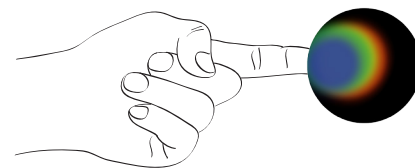
1. Fold an index card in half by placing the short sides together.
2. Print a title on the front of the card as shown.
3. Open the card and place the TLC Dot Sticker on the right side of the fold.

You have made a storage foldable for the TLC Dot Sticker.



### Investigation #1 Heating a TLC Dot Sticker

1. Place the TLC Dot Sticker on the tip of your index finger.
2. Observe the changes in color of the sticker.



### Expected Results

At room temperature, the sticker is black.

Heat from your finger is transferred to the sticker and spreads outward. The colors most visible in order from the hottest to the coolest part of the heated sticker are: blue, green, yellow, orange, and red. Where the dot is not heated, it remains black.

### Investigation #2 Cooling a Heated TLC Dot Sticker

1. Rub your fingers over the surface of the TLC Dot Sticker in the foldable. Continue heating the sticker with your fingers until the sticker turns black.
2. Quickly rub the ice cube over the surface of the heated sticker. Observe how the sticker's color changes as it cools. Continue to cool the sticker until it turns black.

### Expected Results

The TLC dot sticker is black at all temperatures below 25°C and above 31.5°C. This is because the TLC molecules are transparent at all temperatures except between 25°C and 31.5°C. In this temperature range the TLC Dot Sticker displays all the colors of visible light, which are red, orange, yellow, green, blue, indigo, and violet. But generally only red, yellow, orange, green, and blue are distinguishable..

### What Scientists Do

Like any scientist, you investigate to find answers to science problems. Now, like a scientist, in your own words, describe your investigation, what you did, the results, and your explanation of what happened. Record this in your TLC foldable.

# TLC Dot Sticker Science/Art Activity

## Fashion a TLC Dot Sticker Mood Ring

### Materials

ruler 1 sheet of copy paper (any color)  
pencil transparent tape  
scissors 1 Janice VanCleave TLC Dot Sticker

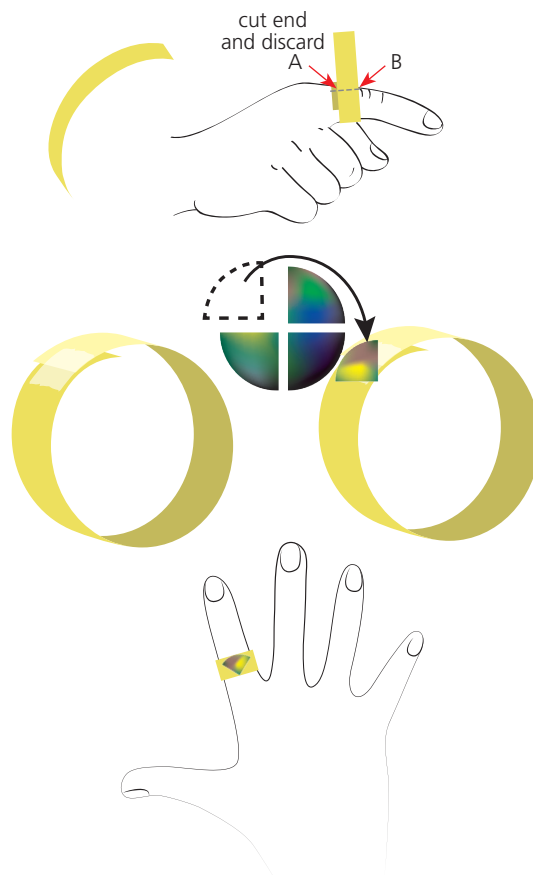
### What to Do

1. Measure and cut a 1/2 in x 4 in. (1.25 cm x 8 cm) strip from copy paper.
2. Wrap the strip of paper around your finger overlapping the ends.
3. Ask a helper to mark line A, which is where you want the overlapping end to be cut.
4. Ask your helper to mark line B, which identifies where the overlapping end will be taped.
5. Remove the strip from your finger, then cut across line A. Discard the short cut-away piece.
6. With one end even with and overlapping line B, secure the ends with transparent tape.
7. Cut one TLC Sticker in half two times. Four equal pieces will be formed as shown. These pieces represent "mood stones."
8. Stick one of the mood stones on the paper ring above where the ends overlap and are taped. A mood ring is formed.
9. Place the ring on your finger. Observe any color changes in the "mood stone" as well as your mood.

### Expected Results

The "mood stone" changes color in response to how warm your ring finger is.

Does your mood affect the color of the mood stone?



### Mood Stone Colors

<b>DARK BLUE:</b>	Happy
<b>BLUE:</b>	Calm or relaxed
<b>BLUE-GREEN:</b>	Somewhat relaxed
<b>GREEN:</b>	Normal or average
<b>AMBER:</b>	A little nervous or anxious
<b>GRAY:</b>	Very nervous or anxious
<b>BLACK:</b>	Stressed, tense or feeling harried

### Did You Know

The TLC molecules twist in one direction when heated from 25°C to 31.5°C. The TLC molecules are grouped much like a winding stair case in that they form a twisted pattern around an imaginary center axis. As the molecules twist in one direction, they absorb and reflect different colors of visible light, which are: red, orange, yellow, green, blue, indigo, and violet. The light reflected is the color you see.

Cooling the TLC Dot Sticker from 31.5°C to 25°C results in the TLC molecules twisting in the opposite direction. Thus, the molecules reflect the same light sequence of colors, but in reverse. The temperature change is generally so fast that it is generally difficult to determine the sequence of the colors.

You will find more Janice VanCleave Sticker investigations and Science/Art Activities  
HERE:

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