



CHROMA CIPHER

ACTIVITY

Your Mission

Looking for a new way to hide a secret message? Try this trick using thermochromic paint! When the paint is heated to a specific temperature, it turns colorless and the secret message is revealed! When the temperature falls below that threshold, the paint color returns and the message is hidden again.

What You Need:

- An art canvas (any size)
- Pen or Pencil
- Black-to-Colorless (82°F or 100°F) Thermochromic Pigment Powder* (you can find this at a craft supply store, or a large online retailer)
- Paintbrushes
- Plastic cups
- Clear medium (such as acrylic paint or Mod Podge)
- Cipher wheel or code book (optional)

How To Make It

- 1 Write a secret message somewhere on your canvas using pencil or pen. To make the message extra secure, write the message using a cipher key or special code.
- 2 Using a paintbrush, mix 1-part thermochromic pigment powder with 2-3 parts clear medium in a plastic cup.
- 3 Use the mixture to paint over your secret message. Let dry completely. When dry, the message should be completely hidden, and the paint should be dark grey or black. If you can still see your message, add a second coat of the thermochromic paint. Let dry completely.
- 4 Paint a picture on the canvas that blends in with the dark grey/black paint spot (but don't paint over it). For example, you can turn the dark grey/black spot into a black sports car and then paint scenery around it. Or turn the dark grey/black spot into storm clouds, or a black bear, or a starry night's sky!

How To Use It

- 1 Once your painting is finished and dry, you can...
 - **Find a place to hang it.** No one will know it's hiding secret information!
 - **Gift it to a fellow agent.** No one will know you're really passing secret information from one spy to another.
- 2 To reveal the secret message, place your hand on the spot where you wrote the secret message. Your body heat will increase the temperature of the thermochromic paint, and the paint will turn colorless revealing the secret message.

**If you are in a warm climate, consider using a pigment powder that changes color at a higher temperature, so the paint won't change on a hot day! Then, use a hair dryer to heat the paint to its reaction point.*

Other Uses

- Besides Black-to-Colorless thermochromic paint, there are other paints that change from one color to another color when heated. Consider using the hidden color as a secret signal (Example: If the paint changes to yellow when heated then the answer is "Yes" and if the paint changes to red when heated, the answer is "No.") Paint two canvases, one using Black-to-Yellow pigment, the other using Black-to-Red pigment. Determine which canvas to hang based on the information you need to pass on to a fellow agent.
- Canvases aren't the only things you can use thermochromic paint on. Consider using thermochromic paint on paper, cardboard, wood, or plastic surfaces to conceal a secret message or code! You could even paint the outside of a ceramic mug and then fill it with hot water or cold water to send a secret signal.

How It Works

The color-changing pigment contains billions of tiny, spherical microcapsules filled with liquid crystals. When heated to a certain temperature, the liquid crystals position to produce an apparent change of color. When cooled, the liquid crystals re-position back to their original state, causing the appearance of the original color to return.