

COFFEE TABLE EXPERIMENTS

TURMERIC SUN PRINTS

COFFEE TABLE SCIENCE

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Coffee Table Experiments Presents

TURMERIC SUN PRINTS

OBJECTIVE:

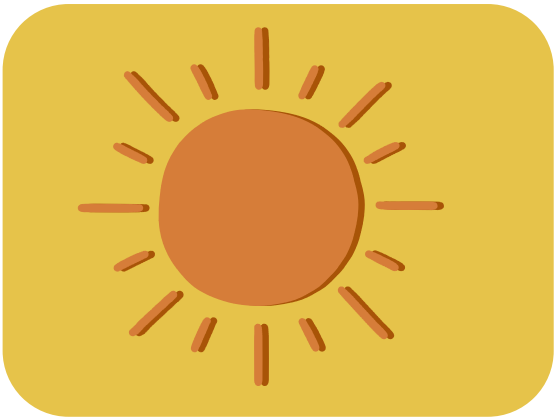
To create natural art by using light-sensitive plant materials (anthotype printing) and to observe a pH reaction.

MATERIALS NEEDED:

1. Sunlight
2. Cotton or linen fabric or watercolor paper
3. Natural objects (flowers, leaves, flat rocks, sticks)
4. Borax or baking soda
5. Rubbing alcohol
6. Warm water
7. Turmeric powder
8. Paint brush or sponge
9. Two small bowls (for mixing)
10. Measuring spoons/cups
11. Spray bottle
12. Tongs (recommended)
13. Clear glass or acrylic sheet (to secure objects)
14. Safety glasses
15. Gloves (recommended)
16. Tray or bin (to work in for easy cleanup)
17. Plastic sheet or drop cloth (turmeric stains!)

BACKGROUND:

Turmeric is a yellow-orange colored spice commonly used in Indian food and contains a chemical called **curcumin**. Curcumin is a photosensitizer, meaning it reacts with sunlight. Because of this, it's commonly used in **anthotype printing**—a process using plant products to create images on materials like paper and cloth by exposing them to sunlight. Through **photodegradation**, ultraviolet light breaks down the curcumin, causing its color to fade.



SAFETY NOTES

- ***Adult supervision required***
- Adults should handle all glass
- Adults should handle borax
- Turmeric stains (wear gloves)
- Safety glasses (protect your eyes)
- Rubbing alcohol is flammable



PROCEDURE

#1 MAKE TURMERIC PAINT

1. Place **2 teaspoons** of **turmeric powder** into a small bowl
2. Add **4 tablespoons** of **rubbing alcohol** to the turmeric
3. **Stir** the mixture with the paintbrush until combined

#2 MAKE THE BORAX OR BAKING SODA SOLUTION

1. Fill a second bowl with ½ cup of **warm water**
2. Add **2 tablespoons** of **borax** or **baking soda** to the bowl
3. **Stir** until the powder has dissolved
4. Pour the solution into the **spray bottle**

#3 PREPARE THE PAPER OR CLOTH

1. Use the **paintbrush** to **coat** the paper or cloth with the **turmeric solution**
2. Let it dry in a dark place for 5 minutes— repeat this step 2-3 times

#4 SET YOUR OBJECTS & EXPOSE PRINTS TO THE SUN

1. Place the painted materials on a **tray or wood board** and **arrange** the **natural materials** you chose for your prints. ***Tip:*** Use your tongs.
2. Cover the items with a **glass** or **acrylic sheet** and place them outside in **direct sun** for 2-4 hours. ***Tip:*** If any sunlight reaches underneath your items, the print will ***not*** work!
3. When the sun-exposed sections of your print are a **light**, **creamy color**, you're ready to bring your print inside

#5 COMPLETE THE FINISHING TOUCHES!

1. Fill a **large glass dish** with enough **water** to cover one print at a time
2. **Remove** the **objects** from your print. ***Tip:*** Use your tongs.
3. **Spray** the print with the **borax** or **baking soda solution** and note any **color changes**
4. Place the **print** in the **water** and **gently rub** it with your fingers
5. Repeat with the rest of your prints
6. Hang the prints to dry or them flat on a paper towel in a dark area until completely dry

OBSERVATIONS TO MAKE:

DIFFERENCES IN MATERIALS



COLOR SHADE CHANGE



SPEED OF REACTION



RECORD YOUR OBSERVATIONS IN YOUR RESEARCH NOTEBOOK!



WHAT IS PH

pH is a **measurement** of how **acidic** or **basic** a liquid is on a scale from **0 to 14**. Borax and baking soda are **basic**, meaning they have a **pH higher** than **7**. Curcumin is yellow in neutral (pH 7) or acidic solutions.

WHAT'S HAPPENING?

Curcumin molecules are **photosensitizers**, meaning they **absorb energy** from sunlight. This energy rearranges the molecule's structure, generating reactive oxygen and causing the curcumin molecules to **break down** in a process called **photodegradation**.

THE COLOR RESULT

The curcumin molecules are now smaller molecular fragments that can no longer **absorb light**, resulting in a lighter, **pale yellow** color. Spraying the final print with borax or baking soda prevents the unexposed curcumin from fading in the sunlight and alters the color through a **pH reaction**.

PH LEVEL CHANGES COLOR

Curcumin is also a **natural pH indicator**—it stays **yellow** in **acidic or neutral** (pH 7) **solutions**. Baking soda and borax are **bases**, so when mixed with curcumin, they **raise** the pH and interact with the **molecular** structure, shifting the **color** to a **reddish** hue.

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Send us an email with a picture of your elephant toothpaste & let us know what you thought of this experiment!



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