



IRON OXIDE TIE-DYE ACTIVITY

Adapted from: Saint Vincent College Environmental Education Center
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Purpose: To emphasize recycling and what can be done with the iron hydroxide (iron oxide when dried) collected from abandoned mine wetlands. **Difficulty:** Average **Time:** 30 Minutes (depending of types of folds)

Supplies (for 1-5 shirts depending on size):

- Rubber Gloves
- 4 Liters of warm water (~1 gallon)
- 2 Tablespoons of Iron Oxide Pigment (1 oz. by volume or $\frac{1}{4}$ - $\frac{1}{2}$ oz. by weight)
- 2 Tablespoons of Baking Soda (or Washing Powder)
- 2 Buckets (mop bucket size)
- 2 Paint Stirrers to stir the solutions
- Rubber bands
- Materials to be dyed: T-shirts or other types of white cotton fabric. Old t-shirts work well. New fabrics must be washed and dried to remove sizing. **DO NOT USE FABRIC SOFTNER.**

Directions:

1. Prepare the dye solution: Wearing the rubber gloves, mix 2 liters (~1/2 gallon) of hot or warm water with the 2 tablespoons of iron oxide powder in one of the buckets. Stir to get all of the mixture to dissolve. (Not all of the powder will dissolve BUT it will be useful for the coloration.)
2. Prepare the rinse solution: Wearing the rubber gloves, mix 2 liters of hot or warm water with the 2 tablespoons of Baking Soda (Sodium Bicarbonate) or Washing Powder (Sodium Carbonate) in the other bucket. Stir with a paint stirrer to dissolve the powder as much as possible.
3. Fold the material in the desired patterns and tie off with rubber bands or knots. Remember the more rubber bands / knots you place on the material, the more white space will be present in the resulting pattern. (You may remove the rubber gloves for this step See Pages 2-3 for some sample patterns)
4. Wearing the rubber gloves, submerge washed and dried white cotton fabric or t-shirt into the mixture.
5. Let soak at least 20 minutes, stirring or kneading occasionally to work the dye solution into the fabric.
6. Remove the item from the dyeing solution. Wring excess water from fabric.
7. Soak the dyed fabric in the rinse solution for approximately 3-5 minutes and work the solution into the fabric by kneading it. You will lose some of the dye in this step, but the item should still be quite dark.
8. Remove the rubber bands / knots and air-dry completely. This important step should finish fixing the pigment.
9. Hand-wash with a little laundry detergent and warm water then air-dry again before wearing. Afterward, you may wash and dry like any colored clothing item. **REMEMBER TO ALWAYS WASH WITH LIKE COLORS**

DISCLAIMER: The quality of iron oxide pigment will determine the quality of the dye. Most of the AMD that has been sampled here in Eastern PA contains 90% or better pure iron oxide; however, some discharges contain other metals such as aluminum and manganese which can "spoil" the pigment. EPCAMR gets permission before removing iron oxide from nearby wetlands and streams. The AMD Sludge that EPCAMR uses has been tested at an independent lab to make sure that no caustic or harmful materials exist within the material before it is used for pigment. Disposal of solutions are safe for you and the environment in small quantities! You can pour the leftover solution on the lawn and it won't hurt it. In fact, Iron Oxide is an ingredient in many lawn fertilizers. Do watch out for ornamental shrubs, which may not like iron rich soil, however. Sodium Carbonate will raise the pH of the soil which also promotes healthy grass growth in naturally acidic soil (predominant in coal mined areas).

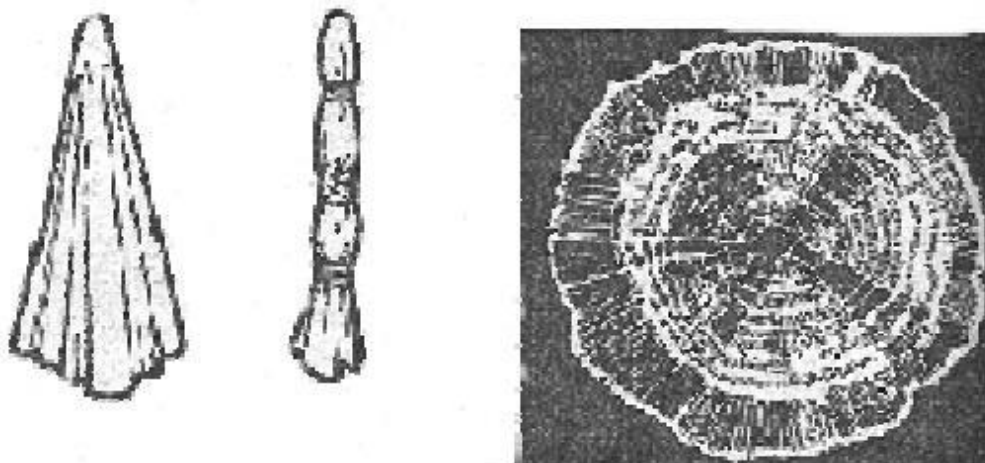
A. STRIPES - Fold the fabric back and forth as if you're making a fan or an accordion. Secure with rubber bands at intervals all along the body of the shirt. Horizontal stripes are created by starting the fold from one sleeve. Vertical stripes are created by starting the fold from the collar. Diagonal stripes are created by starting the fold from one of the bottom corners.



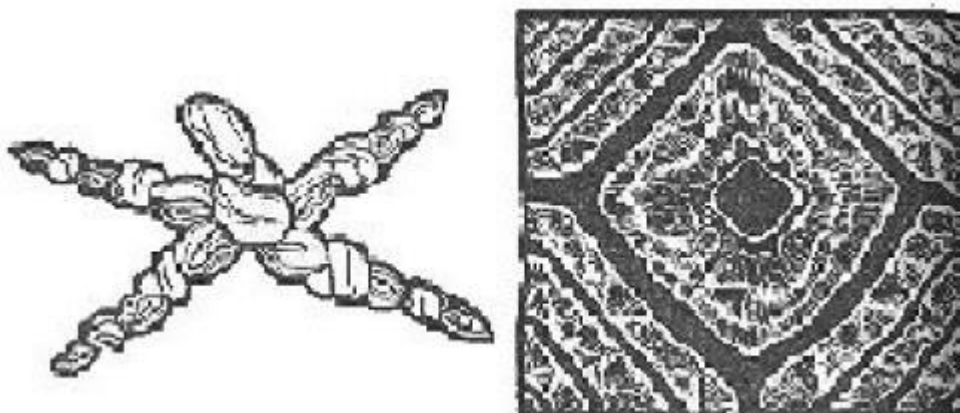
B. OVERALL PATTERNS - DON'T FOLD THE SLEEVES! Hold the fabric at the neck and the tail and twist until the shirt twists back onto itself. Fold the neck to the tail and tie the shirt firmly using rubber bands. You may also hold the shirt by one sleeve and the opposite bottom corner and twist.



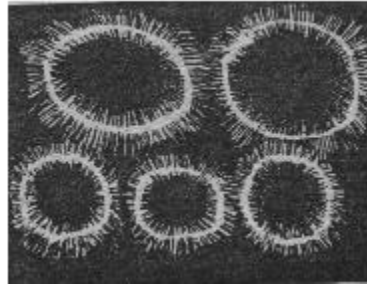
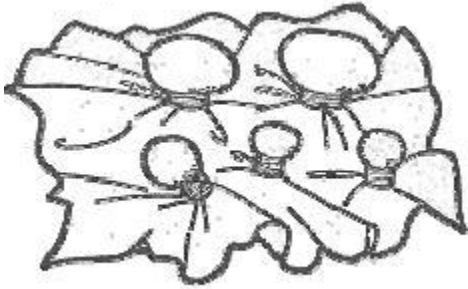
C. CIRCULAR PATTERNS - Pinch up a spot on the center in the front of the shirt with one hand and place your finger on the back of the shirt to gather both layers of the material. Tie the material with rubber bands to make a bull's eye or sunburst pattern. Try pinching in different places to center the bull's eye in a different place.



D. DIAMOND PATTERN – Pinch up a spot on the center in the front of the shirt (similar the circular pattern) and tie a knot in the middle of the shirt. Grab the corner of one sleeve and twist then begin tying or banding the material from the outside and work toward the knot. Band the other 3 corners of the shirt in the same fashion until you get something that looks a little like a 4 legged squid.



E. SPOTTED & ROUNDED PATTERN - Tying objects in your shirt will result in an interesting pattern. Look at the shirt below. Marbles or rocks can be placed into the shirt and rubber banded to make this look. You may gather both layers of material or just one to experiment with designs.
 Halloween idea: Draw jack-o-lantern faces with sharpie marker after it's dry. ->



F. TYING IN KNOTS - Tying knots in the material itself can create various effects. Roll the fabric up into a tube and tie knots as firmly as you can along its length. You may also want to try fold the fabric in half first.



G. MARBLING - This gives an all over pattern which will look more like clouds or marble rather than a definite pattern. The cloth needs to be crumbled up into a tight ball using rubber bands to put around the ball as tight as possible going in different directions.



Have fun afterward, trying to guess what the pattern looks like.

Feel free to experiment with these patterns... Here's one based a simpler pattern above.

V-PATTERN- First fold the fabric in half. Then starting at one corner, fold the fabric in even segments back and forth accordion style (similar to stripes pattern). Add rubber bands as you go to fasten the material.

There are many other patterns out there in craft books at your local library or on the internet.

See EPCAMR Environmental Education and AMD Tie Dye Workshops Photo Galleries at our www.epcamr.org website. You can purchase pigment at our online store. Direct questions or comments to hardcoal@epcamr.org.

Remember, it's not an exact science, it's an educational activity. Have fun with it!