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Fiber-Reactive Dyeing

A Reflection

By: Dana Stull – Chemistry in Art

Chemical concept

The chemical concept in this project centered around the fibers in the cotton t-shirt reacting with the tie-dye solution. Cotton has polymers called cellulose, that has hydroxyl groups that will react with a dye and attach the pigment onto the fabric. This process was key in our tie-dyeing pursuits. There are many types of dyes other than fiber-reactive dyes. Acid dyes, basic dyes, direct dyes, azoic dyes, vat dyes, disperse dyes, and solvent dyes are all other methods. Acid dyes interact with a basic fiber, and occurs through electrostatics. Basic dyes interact with an acidic fiber. Direct dyes don't require a mordant, and interacts with fibers through hydrogen bonding. Azoic dyes are synthesized into the fabric, where one mixes colorless reactants within the fabric to react and form a dye. Vat dyes utilize an insoluble dye that is rendered colorless and water soluble in the vat. The dye is then chemically reverted to a colored form after fibers have soaked in it, through some type of redox reaction. Fiber reactive dyes react with the fiber to form a covalent bond attachment, usually done under basic conditions. The dyes attach to oxygen, nitrogen, or sulfur atoms in the fiber. Disperse dyes are insoluble dyes that attach to fibers via non-polar Van der Waal's interactions. Solvent dyes are insoluble in water, but soluble in organic solvents, and has a non-polar interaction with fibers.

Personal reflection

This project helped me to fully understand how fiber-reactive dyeing works. I had tie-dyed before, but I never realized what was actually going on to make the dye stay on the shirt. By applying the chemical concept I learned in class to the actual project, I was able to see the chemical process in action and apply it to everyday life.