

Secret Messages Experiment

Materials

- Lemon Juice
- Cotton-Swab or paint brush
- Small plastic cup]
- Plain white paper

Procedure

1. Add about 1 tablespoon of lemon juice to the cup. Fresh squeezed or bottled juice will work.
2. Soak an end of the cotton swab or put the paint brush into the lemon juice. You'll use this to write your message.
3. Write your message on the plain paper. You'll be able to see it as long as the paper is wet, so let the lemon juice message dry completely.
4. When you are ready to reveal the message, place the paper above a heat source. If using an open-flame, **make sure that an adult is present to help out.**

How Does it Work

Most invisible ink messages can be revealed by heating either side of the paper on which they're written. The message discolors before the rest of the paper gets hot enough to do so. When you wrote your message using the lemon juice, carbon-based compounds in the juice were absorbed into the paper's fibers. Also, since lemon juice ink is a weak acid, it softened the fibers in the paper. The added heat caused some of the chemical bonds to break down in the dried juice and some carbon was cut loose. When the carbon came into contact with air, it burned or oxidized. One effect of oxidation is things turn a darker color. (Some oxidation doesn't need heat to occur; it just needs a little air. Think of a piece of apple, banana, or pear left out on a plate for a while.)

Lemon juice – like most fruit juice – contains carbon compounds. These compounds are pretty much colorless at room temperature. Heat breaks down these compounds and releases the carbon. When carbon comes in contact with air (specifically oxygen), oxidation occurs and the substance turns light or dark brown. If it oxidizes long enough, it can go all the way to black.