

FOAMY FLASK/ELEPHANT TOOTHPASTE

Science Project

WHAT YOU NEED:

- PPE (personal protective equipment): gloves, apron, and goggles
- Hydrogen peroxide, 6% or higher (available at beauty supply stores)
- Baking dish or pie tin
- 250 ml flask
- Funnel
- Graduated cylinder
- Yeast
- Food coloring

Make a dramatic demonstration of a chemical reaction with this spin-off of the classic “elephant toothpaste” experiment. This version catalyzes a chemical decomposition using only common household items, making it safer for home labs and younger scientists. While the chemicals used may be ordinary, the results are exceptional!

WHAT YOU DO:

1. Safety first! Before beginning the experiment, put on your PPE.
2. Use the graduated cylinder to measure 50 ml hydrogen peroxide, and pour it into the flask.
3. Add a few drops of food coloring if you like.
4. Place the flask in the middle of a pie tin or baking dish.
5. Measure 10 ml dish washing soap, and add it to the flask.
6. Open the packet of yeast, and pour its contents through the funnel into the flask. Quickly remove the funnel.
7. Feel the outside of the flask, and note its temperature. Wait a few minutes to see foam come streaming out of the flask.
8. Dispose of the remaining mixture by pouring it down the sink and rinsing with hot water.

WHAT HAPPENED:

Hydrogen peroxide’s chemical formula is H_2O_2 . H_2O is liquid water, and O_2 is oxygen gas. In this experiment, we observed the chemical decomposition of hydrogen peroxide. Chemical decomposition is the separation of a chemical compound into elements or simpler compounds. In this case, hydrogen peroxide decomposed into water and oxygen. The chemical expression for what happened is: $2 H_2O_2 \rightarrow 2 H_2O + O_2$.

Adding the yeast sped up the process. Enzymes in the yeast called catalase acted as a catalyst—a substance added to a chemical mixture that speeds up the chemical reaction time. The yeast wasn’t necessary to make foam — only water, soap, and a whole lot of oxygen gas was necessary. But adding the yeast made the hydrogen peroxide decompose (break down) much more quickly than it would normally, releasing oxygen and water faster. The dish soap made the production of oxygen more noticeable because of the foam. This reaction also created heat, so it’s what’s known as an exothermic reaction, a reaction that releases heat energy.

Another interesting fact about hydrogen peroxide: it is sometimes used as rocket fuel. When hydrogen peroxide breaks down rapidly, it produces a lot of oxygen gas, which propels the rocket into the air. The hydrogen peroxide HST sells is a solution of water and hydrogen peroxide, as is the kind most of us keep in our medicine cabinets—30% and 3% respectively. Hydrogen peroxide that powers rockets is at least 90% concentration.