

## Demonstration Risk Assessment “Elephant’s Toothpaste”

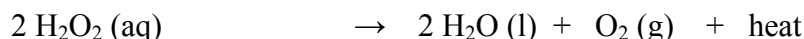
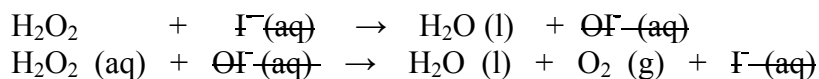
**Prepared By:** Samuella Sigmann **Date Prepared:** July 16, 2016 **Date Revised:**

### Demonstration Statement

A slightly yellow solution is created in a 1 L cylinder with hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is mixed with Joy dish soap.<sup>1</sup> When a scoop of potassium iodide (KI) is added to the cylinder, a foam resembling toothpaste rises out of the opening. As KI catalyses the rapid decomposition of (H<sub>2</sub>O<sub>2</sub>) and in the presence of soap the rapidly generated oxygen from the decomposition will create mounds of fine suds filled with oxygen gas.

### The Chemistry

The reaction proceeds nearly immediately once the KI is added. The reactions for the decomposition are shown here.



### Reactivity Hazards

Known Incompatibilities

- hydrogen peroxide (SA SDS): zinc, powdered metals, copper, nickel, brass, iron and iron salts.
- potassium iodide (BDH SDS) strong reducing agents, Nickel, Strong acids, and its alloys, Steel (all types and surface treatments), Aluminum, Alkali metals, Brass, Magnesium, Zinc, cadmium, Copper

### Information Sources Used and/or Reviewed

- Potassium Iodide: Sigma Aldrich SDS, product #221945, Version 4.10 Revision Date 12/02/2015.
- Potassium Iodide: Fisher Scientific SDS, product #'s P410-10; P410-100; P410-3; P410-500, Creation Date 14-Sep-2009.
- Potassium Iodide: VWR, product C6459 (27.02.2016), 74210 (27.02.2016), and BDH product # BDH9264 SDS.
- eChemPortal GHS J
- Hydrogen Peroxide Solution: Sigma Aldrich SDS for product # 216763, Version 4.13 Revision Date 05/24/2016
- Dr. XXX, personal communication
- Eldridge, D. Using Elephant’s Toothpaste as an Engaging and Flexible Curriculum Alignment Project. *J. Chem. Educ.* **2015**, 92, 1406–1408. DOI: 10.1021/acs.jchemed.5b00037

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<sup>1</sup> Any dish soap can be used, but Joy works the best for generating the desired size of bubbles. The hazards are not affected.

- Porcja, B. Catalytic Decomposition of Hydrogen Peroxide by Potassium Iodide. Rutgers Chemistry Lecture Demonstration (CLD) Facility.  
<http://cldfacility.rutgers.edu/content/catalytic-decomposition-hydrogen-peroxide-potassium-iodide> (accessed July 17, 2016).
- Catalytic Decomposition of H<sub>2</sub>O<sub>2</sub> – Elephant’s Toothpaste. NCSU Dept. of Chemistry Lecture Demonstrations, Kinetics.  
<https://ncsu.edu/project/chemistrydemos/Kinetics/Elephants%20Toothpaste.pdf> accessed July 17, 2016).

### **Equipment Required with Known Hazards**

Spill tray, 1 L cylinder (sharps), scoopula

### **Safety and Emergency Response Equipment**

*For ER:*

No unusual ER equipment is needed. Standard laboratory ER equipment should be available. If demo is performed as outreach or in the classroom, include portable bottle of eyewash solution.

*For Spills:*

- H<sub>2</sub>O<sub>2</sub> can be cleaned up with wet paper towels using gloves. Rinse prior to placing in the trash can. Avoid inhalation.
- KI spills should be gathered up with a small broom and dust pan and dissolved in a beaker of water. Solutions with pH between 5 and 9 can be drained disposed in most areas. Check local regulations.

### **PPE**

Chemical splash goggles, nitrile gloves, lab coat (optional)

### **Preparation Instructions with Associated Hazards & Controls**

Gather chemicals and equipment. There are no known hazards other than breaking glass or spilling reagents while gathering equipment. See demonstration procedure for those controls.

**Table 1: Information for Reagent Preparation**

| Chemical<br>(Add rows<br>as needed)                                    | MW<br>g/mol | Concentration<br>Required for Demo | Amount<br>Required<br>for Demo | Amount of<br>Chemical<br>Needed for<br>Preparation | Amount<br>Recipe<br>will Prepare |
|--|-------------|------------------------------------|--------------------------------|--|----------------------------------|
| hydrogen peroxide<br>(H <sub>2</sub> O <sub>2</sub> )<br>CAS 7722-84-1 | 34.0        | 30%<br>(~9 M)                      | 150 mL                         | Buy at required<br>concentration                   | N/A                              |
| potassium iodide (KI)<br>CAS 7681-11-0                                 | 166         | Solid (99+)                        | ~10 g (scoop)                  | Buy at required<br>concentration                   | N/A                              |
| Joy dish soap  | -----       | As purchased                       | ~25 mL                         | Buy at required<br>concentration                   | N/A                              |
| Food Coloring<br>(Optional)  | -----       | As purchased                       | drops                          | Buy at required<br>concentration                   | N/A                              |

## Demonstration Instructions with Associated Hazards & Controls

1. Don chemical splash goggles and nitrile gloves
2. Add ~150 mL of 30% H<sub>2</sub>O<sub>2</sub> to the cylinder  
**Hazards:** splash, spill, sharps  
**Controls:** Ensure audience is back 10 ft; review spill response procedures prior to demo, wear eyewear and recommended gloves, ensure eyewash is functioning and available (alternate is eyewash solution in a bottle), clean up broken glass using broom and dustpan
3. Add ~25 mL of dish soap to the cylinder and swirl to mix
4. Place cylinder on tray
5. If desired, add 4 drops of food color of choice at 4 points around the cylinder opening. Do not add to the H<sub>2</sub>O<sub>2</sub>/soap unless you want the “toothpaste” to be a uniform color rather than striped.
6. All at once add the scoopful of solid KI and swirl slightly.  
**Hazards:** splash, spill, dermal contact, heat, sharps  
**Controls:** Ensure audience is back 10 ft and do not allow observers to touch foam, review spill response procedures prior to demo, review ER for dermal contact of KI, continue to wear eyewear and gloves, have running water available, allow cylinder to cool prior to disposal, clean up broken glass using broom and dustpan

## Waste Disposal

Unused reagents (if any) should be returned to storage.

This demo does not generate any known hazardous waste and may be flushed down the sink with water. However, since local ordinances may vary, it is always advisable to check local ordinances.

## General Information

Conflicting hazard information was found on the hazards of potassium iodide. Sigma Aldrich lists KI with an exclamation point and warning signal word. Fisher Scientific lists it not requiring GHS elements. At VWR, I saw skull and crossbones for KI granules (product 74210) and none for KI (product # C6459, and exclamation point for a BDH product. Assume that it is a target organ hazard (fetus).

There are some known incompatibilities

- I have read the required information on the hazards of this demonstration and understand the risks to the demonstrator and audience

Signed:

Date:

**Ventilation Requirements:**

- hoods for preparation
- hoods for demonstration
- demonstration must be performed outside
- normal room ventilation

**Emergency Equipment Requirements:**

- standard lab ER equipment
- eyewash/shower
- spill kit
  - running water
- fire extinguisher

**Waste Requirements:**

- labeled waste container(s) needed
- neutralize and dispose
- flush down drain with water

**PPE Requirements (Demonstrator):**

- gloves
  - nitrile (all chemicals)
  - Type
  - Type
- eyewear
  - chemical splash goggles
  - (demonstrator)
  - eyewear for audience (no)
- lab coat
  - not required

**Reactivity Precautions:**

- flammable solvents
- corrosives
- oxidizers
- incompatible wastes