

**14.3A: Catalytic Decomposition of H<sub>2</sub>O<sub>2</sub> II - "Aladdin's lamp"**

**Subjects:** Kinetics, catalysis, exothermic reactions

**Description:** When a stopper is removed from a bottle, a large cloud of vapor and heat escapes giving the appearance of a jinni in a bottle.

**Materials:**

1L Florence flask and a stopper to fit opening  
Aluminum foil to cover bottle (optional)  
30-50 mL 30% H<sub>2</sub>O<sub>2</sub>‡  
~1/4 tsp solid KI or NaI‡  
Kimwipe or tissue and string (optional)  
Ring stand, support ring, and clamp (optional)\*

‡H<sub>2</sub>O<sub>2</sub> is located in the refrigerator. KI and MnO<sub>2</sub> are located in the chemical storage cabinet.

\*Shared item: Locate on the shelf above the center bench.

**Pre-class Preparation:**

1. For a more dramatic effect, cover the bottle with aluminum foil (optional)
2. Fill the Kimwipe with the KI or NaI and tie with a string (optional)
3. Place the H<sub>2</sub>O<sub>2</sub> in the bottle.
4. Hang the KI or NaI inside the flask by securing the string against the mouth of the flask with the rubber stopper.

**Procedure:**

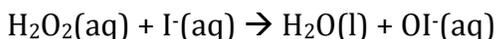
1. When ready to perform the reaction, remove the stopper to let the KI or NaI fall into the H<sub>2</sub>O<sub>2</sub>. If you don't want to use the Kimwipe, add solid KI NaI via a spatula.
2. Hold the bottle by the neck and point the bottle up and in a safe direction. Within a few seconds, an exothermic reaction will take place, producing a cloud of O<sub>2</sub> gas and water vapor.
3. If you don't want to hold the bottle, support it with a ring stand and clamp.

**Discussion:**

The decomposition of H<sub>2</sub>O<sub>2</sub> to O<sub>2</sub> and water occurs on its own. The rate of the reaction can be substantially increased with the addition of a catalyst. Several substances, including potassium iodide and manganese dioxide are known to catalyze the reaction.

Overall Reaction:  $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + \text{heat}$

Using iodide, IO<sup>-</sup> is believed to be the reaction intermediate:





**Safety:** Concentrated  $\text{H}_2\text{O}_2$  can cause burns. Be sure to wear safety glasses and gloves when performing the experiment.

**Disposal:** The waste products can be flushed down the drain with water.

**References:**

1. L. Summerlin, J. Ealy, C. Borgford; *Chemical Demonstrations: A Sourcebook for Teachers*; Volume 2; p. 42-43; 1987
2. NCSU Department of chemistry lecture demonstration website:  
<http://www.ncsu.edu/project/chemistrydemos/DemoList.html>