Required Training  
UC Lab Safety Fundamentals

Required PPE  
Lab coat, safety glasses/goggles, nitrile gloves

Performers Required: 1

Equipment  
2 L Florence or round-bottom flask and cork ring

Chemicals  
Potassium iodide (KI)

Hydrogen peroxide (H₂O₂), 30% solution

Procedure:
1. Place the flask on the cork ring on the ground at least 10 feet from the audience.
2. Pour ~30 mL of H₂O₂ into flask. The liquid should come up to roughly the level of the top of the cork ring.
3. Add ~0.5 g (or one scoop) of solid KI powder into the flask and quickly move back. The reaction begins slowly, but accelerates as more KI dissolves in the solution. A plume of steam will be released from the top of the flask as the contents boil. Allow the flask to cool sufficiently before moving the demonstration.

Clean-up: Once everything has cooled completely, the solution can be rinsed down the drain with water. Make sure to rinse the flask thoroughly with distilled water to prevent premature reactions in future demonstrations.

Hazards: 30% H₂O₂ is corrosive and strongly oxidizing, causing immediate chemical burns on contact with skin. Always wear nitrile gloves when preparing, performing, or cleaning up this demo. Furthermore, the catalytic decomposition of H₂O₂ is strongly exothermic, and the flask may become warm enough to cause thermal burns during the demonstration.

Principle: This demonstration involves the catalytic decomposition of H₂O₂ into water (H₂O) and oxygen gas (O₂(g)). The overall reaction is:

\[
2 \text{H}_2\text{O}_2(\text{aq}) \rightarrow 2 \text{H}_2\text{O}(\ell) + \text{O}_2(\text{g})
\]

This reaction is slow, but may be catalyzed by the iodide ion (I⁻). One proposed mechanism for this reaction is:

\[
\text{H}_2\text{O}_2(\text{aq}) + \text{I}^-(\text{aq}) \rightarrow \text{OI}^-\text{(aq)} + \text{H}_2\text{O}(\ell)
\]

\[
\text{H}_2\text{O}_2(\text{aq}) + \text{OI}^-\text{(aq)} \rightarrow \text{I}^-\text{(aq)} + \text{H}_2\text{O}(\ell) + \text{O}_2(\text{g})
\]

A significant quantity of heat is also generated (\(\Delta H^\circ = \sim-196 \text{ kJ/mol}\)), which vaporizes some of the H₂O into steam. The steam produces a nice "smoke" effect.
Notes: More is going on in solution than just the reactions given in the mechanism listed above. Upon the addition of KI, the solution becomes a red-brown color that slowly clears, evidence for the formation and subsequent consumption of iodine (I₂) and the triiodide (I₃⁻) anions that form upon reaction with excess I⁻. Research on the reaction mechanisms and kinetics of this system is still ongoing. This demonstration is nearly identical to Elephant Toothpaste, which uses soap to catch the evolved gases. Performing with dimmed lights for the audience and brighter light on the flask enhances the effect.