**Hydrogen Bomb**

*A demonstration of the stoichiometric combustion of hydrogen gas*

# Application

Stoichiometry, Explosions, Gases, Reactivity, Combustion

# Theory

A two-liter soda bottle, with the bottom cut out, is fitted with a one-hole rubber stopper, which holds the glass tip of a dropper. The bottle is filled with hydrogen gas by the downward displacement of air. The hydrogen gas is ignited and slowly burns in the presence of oxygen from the air outside of the bottle. The burning of the gas causes a whistling sound to be emitted through the glass orifice. As the hydrogen gas is consumed the bottle slowly fills with air through the bottom opening. As the hydrogen concentration decreases the whistle diminishes and the flame grows weak. Eventually the flame is drawn into the bottle, which causes the hydrogen—air mixture within to explode with a bright yellow light.

When ignited the hydrogen reacts with oxygen to produce water vapor:

2 H2  + O2 🡪 2 H20

# Materials

Two-liter plastic soda bottle, with bottom removed

Stopper to fit bottle, 1-hole

Glass tube from medicine dropper

Hydrogen gas

Ring stand and clamp

# Safety Precautions

Hydrogen gas is very flammable and yields explosive mixtures with air. Do not have any open flames while filling plastic bottle. If using a gas cylinder, secure tank to wall to prevent accidental tipping. Students should be warned of explosive noise and told to cup hands over ears. Do not use a glass bottle for this demonstration. Wear chemical splash goggles, chemical-resistant gloves and a chemical resistant apron.

# Preparation

Cut off the bottom of a two-liter soda bottle. Insert the glass tube of a medicine dropper in the whole of a 1-hole stopper, with the thin stem pointed out. Secure the stopper on the soda bottle. Clamp the bottle to a ring stand.

# Demonstration

Fill the bottle with hydrogen gas through the bottom. Set the hydrogen cylinder aside. Ignite the hydrogen at the tip of the glass tube. A blue flame should be visible. The whistle should diminish prior to explosion.

# Disposal

None required.

# Reference

This demonstration was presented by Ron Perkins during the Fundamentals Institute at the Institute for Chemical Education; University of Wisconsin—Madison, July, 1989.