THE PREPARATION OF OXYGEN

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INTRODUCTION

One of the most exciting demonstrations in chemistry is the production of oxygen and the glowing splint test. I have performed this as a demonstration and as an activity as part of a classroom workshop. I never cease to marvel at the excitement on the faces of the audience as the glowing splint bursts into flame when placed in an enriched oxygen atmosphere.

This demonstration should immediately follow The Chemical Genie as part of the explanation for that demonstration.

MATERIALS NEEDED

Flask, 500 mL. Florence flask (flat bottomed round, boiling flask) preferred.
Wood splints
Matches
Candle or burner
Tongs, crucible tongs or similar
6% hydrogen peroxide (approximate concentration) – can be made by diluting 1 part 30% hydrogen peroxide with 3 parts water.
manganese dioxide OR potassium iodide OR active dry yeast (catalyst to speed the decomposition of hydrogen peroxide)

SAFETY PRECAUTIONS

Wear safety goggles or glasses

6% hydrogen peroxide is caustic to the skin and eyes. Handle with care. In case of skin contact, rinse the affected areas well with water. Store unused hydrogen peroxide in a freezer reserved for laboratory chemicals only.

Manganese dioxide is a strong oxidant, avoid contact with organic material. Inhalation can lead to increased incidence of respiratory infection and effects on the central nervous system. It is assumed to be harmful if swallowed. Avoid dust. Wash hands well after handling.

This reaction generates heat. Use only Pyrex-type or heat-proof containers.

DISPOSAL

Hydrogen peroxide can be disposed of down the drain with running water.

Manganese dioxide should be disposed of as solid waste in an approved landfill.

PROCEDURE

Place the hydrogen peroxide solution in the flask. Ad a small amount of manganese dioxide or other suitable catalyst to speed up the decomposition of the hydrogen peroxide. Note that the solution is bubbling.

Light a candle or a burner.

Holding a wood splint with tongs, light the end of the wood splint. Allow it to burn for a few seconds until you notice that the end of the wood splint is glowing red. Blow out the flame. Insert the glowing end of the wood splint into the flask. If sufficient oxygen has been generated, the wood splint will burst into flame. Withdraw the burning splint from the flask.

This demonstration can be repeated several times until the reaction has ceased.

EXPLANATION

This reaction is the catalytic decomposition of hydrogen peroxide:

$$2\ H_2O_2 \rightarrow 2\ H_2O + O_2$$

This is the "classic" test for oxygen gas.