

Micro-Rocket Activity: Generating, Collecting & Testing O₂ & H₂

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Adapted from Robert Becker

Materials: (per group) 1 petri dish bottom, 1 micro O₂ generator, 1 micro H₂ generator, one sparking element, bottles of 1.0 M HCl and 3% H₂ O₂, one incremented collection bulb, Mn and Zn.

Background: An exothermic (heat producing) reaction occurs when hydrogen and oxygen gases react with each other. When the proper ratio of gases occurs, the reaction is the greatest. The goal of this activity is for students to determine the most powerful mixture.

Precautions: This lab is done on a micro-scale and although the reactions can be loud, they are safe. Be cautious with both the hydrochloric acid and hydrogen peroxide.

Construction: Make the micro-generators by taking used 35 mm film canisters and poking a hole in the center of the lid. Cut an end piece of a plastic pipette and insert it into the hole. Save the bulb of the pipette for use as the rocket. I hot glued the pipette pieces into place. See the diagram below.

The sparking element is made from a charcoal lighter (such as the Scripto Aim 'n Flame TM Torch lighter), 10 cm of 24 AWG speaker hook-up wire (solid, not stranded, Radio Shack #278-1509), some electricians tape, a film canister lid and a hot glue gun. See the diagram below to construct the sparker.

Launching Procedure: Add several pieces of manganese metal to one of the micro-generators and fill approximately 3/4 full with hydrogen peroxide. Replace the lid with the pipette piece. This becomes the oxygen generator. Put the container in a petri dish to catch the run-off water. Place several pieces of zinc in a second film canister and add hydrochloric acid to approximately 3/4 full. Replace the lid and place the canister in the petri dish. This becomes the hydrogen generator.

To prepare a rocket for launch, fill the bulb completely with water by squeezing the air out of the bulb while submerged in water. Place the open end of the bulb over the nozzle on one of the generators. The water will be displaced as the gas is collected. Once the amount of gas has been collected, transfer the bulb to the other generator and complete the gas collection.

To fire the rocket, place the open end of the bulb over the wire extending from the top of the sparker. Point the rocket bulb in a safe direction and fire.

Data Collection: Students can carefully record the mixture percentages by using the graduations marked on the pipette bulb. Distances can be recorded. Challenge students to determine the best mixture to produce the greatest sound.

