

4.11 Acetylene production/combustion

Subject: Chemical reactions, combustion, oxidation/reduction, equilibrium

Description: Calcium carbide is added to water in a balloon. The acetylene gas produced in the reaction is ignited producing a loud explosion.

Materials:

Balloon
Small amount of calcium carbide[‡] (CaC₂)
Dropper bottle with water
Long rod or meter stick*
Wood splint
Ring stand*
Tape
Matches, lighter or burner
Acetylene lamp (used as a prop)

[‡]Calcium carbide is located in the general chemical storage cabinet.

*Shared items. Matches/lighters are located in the top drawer opposite the storage shelves. Long rods and meter sticks are located on the shelves in the alcove or on the center bench. Ring stands are located on the shelf above the center bench. Extra splints are located in the top, left drawer next to the sink.

Procedure:

Note: Practice this demo ahead of time to get a feel for the amount of CaC₂ needed.

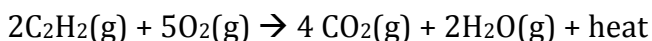
1. Squirt 2-3 ml of water into the balloon.
2. Push a piece of calcium carbide into the balloon
3. Tie off balloon.
4. Observe expansion of acetylene gas
5. When expansion ceases, tape the balloon to a ring stand.
6. Light the splint at the end of the rod.
7. Place the flame next to the balloon.
8. A loud explosion will occur. Alternatively you can perform the reaction in a beaker and light the gas above the reaction. Indicator can be added to the water to show the increase of the pH of the water due to calcium hydroxide formation.

Discussion:

In the reaction between calcium carbide and water, acetylene gas is produced:



The rapid oxidation of acetylene by oxygen produces its combustion products of carbon dioxide and water.



Show the acetylene lamp and describe its use.

Safety: Keep calcium carbide away from water or oxidizing agents. Use caution when performing the demo due to the explosive nature of acetylene. Be sure to perform the demo in a large well-ventilated room. Keep all other combustible materials clear of the demo. Wear proper protective equipment while performing this demo.

Disposal: Balloon fragments can be disposed of in the trash.

Reference:

1) L. Summerlin, J. Ealy; *Chemical Demonstrations: A Sourcebook for Teachers*; Volume 1; 1985; p. 16