

Getting a Bang Out of Chemistry

Reactions of Calcium Carbide—Combustion of Acetylene



Introduction

More than just sparks fly when a flint is struck over the reaction products of water and solid calcium carbide!

Concepts

- Chemical reactions
- Combustion

Materials (for each demonstration)

Calcium carbide, CaC_2 , granular, 1 to 2 g

Wash bottle, filled with distilled water

Carbide cannon

Safety Precautions

When calcium carbide is exposed to water or moisture it evolves flammable acetylene gas which is corrosive to eyes and skin. Perform this demonstration in a well-ventilated area only. Make sure there are no flames in the area. Keep a fire extinguisher on hand and use a safety shield to help protect the student audience. Avoid contact of all chemicals with eyes and skin. Follow all laboratory safety guidelines. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information. Remember to wash hands thoroughly with soap and water before leaving the laboratory.

Procedure

1. Measure out the required amount of calcium carbide granules for your specific cannon and add it to the loader.
2. Add water to the cannon barrel using the wash bottle.
3. Secure the loader and flint igniter to the cannon.
4. Remove all other flammable materials from the demonstration area.
5. Point the barrel of the cannon away from the students. Ask the students to cup their ears. Wait 30 seconds, strike the flint and watch the sparks fly!

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. After calcium carbide has reacted with the water, a basic solution is produced. Neutralize solution with 3 M hydrochloric acid and check with pH paper according to Flinn Suggested Disposal Method #10. Decant the neutral solution and flush it down the drain with at least a 20-fold excess of water. Dry any precipitate in the beaker and package it for disposal in a landfill suitable for chemical wastes according to Flinn Suggested Disposal Method #26a.

Tips

- We recommend that all students or other onlookers wear appropriate eye protection during any demonstration that has the potential to produce heat, gas or pressure. Also, instruct the students to cup their ears before igniting the mixture in the cannon.
- An internet search will bring you to many sites listing carbide cannons for sale.

Discussion

Calcium carbide, CaC_2 , is primarily used to produce acetylene gas. Acetylene gas is a product of reacting calcium carbide with water. This reaction was utilized in carbide (miners') lamps where water dripped on the carbide producing acetylene gas which was ignited. See Equation 1. These lamps were commonly used in slate, copper and tin mines. Since acetylene gas is highly flammable, the carbide lamps were not used in coal mines, where they would be a serious hazard. Most carbide lamps have been replaced today by electric LED lamps.



Acetylene consists of two hydrogen atoms and two carbon atoms attached by a triple bond. When reacted with oxygen, like other hydrocarbons, carbon dioxide and water are formed. See Equation 2. Acetylene is often found as the fuel in torches as it burns brilliantly in air with very sooty flame. It has a very high heat of combustion (1300kJ/mole) and burns with a very hot flame.



Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Systems, order, and organization
Evidence, models, and explanation

Content Standards: Grades 5–8

Content Standard B: Physical Science, properties and changes in matter, motions and forces, transfer of energy

Content Standards: Grades 9–12

Content Standard B: Physical Science, structure of atoms, structure and properties of matter, chemical reactions, motions and forces, interactions of energy and matter

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Getting a Bang Out of Chemistry* activity, presented by Lee Marek is available in *Reactions of Calcium Carbide—Combustion of Acetylene*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *Getting a Bang Out of Chemistry* are available from Flinn Scientific, Inc.

Catalog No.	Description
C0346	Calcium Carbide, 100 g

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.