CHEM FAX!

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Carbon Snake

Chemical Demonstration Kit

Introduction

The following experiment demonstrates an example of an exothermic reaction. It can also be used as an example of a chemical change.

Concepts

- Decomposition reaction
- Catalyst
- Combustion (energy)

Activity Overview

The purpose of this experiment is to demonstrate decomposition of chemicals by combustion.

Materials *(for each demonstration)*

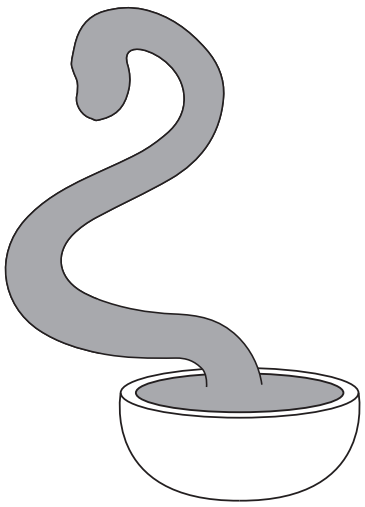
Isopropyl Alcohol, 30 mL*
Sand*
Sodium Bicarbonate, 1 g*
Sucrose, 6 g*
Butane Safety Lighter
Container Vial, small*
Evaporating Dish, 80 mL*

**Included in Kit*

Safety Precautions

Isopropyl alcohol is a flammable liquid and a fire hazard; keep away from all flames, sparks, and heat sources. Isopropyl Alcohol is also slightly toxic by ingestion and inhalation [LD_{50}: 5045 mg/kg]. Wear chemical splash goggles, chemical-resistant gloves and a chemical-resistant apron. Wash hands thoroughly with soap and water before leaving the laboratory. Follow all laboratory safety guidelines. Please review current Safety Data Sheets for additional safety, handling and disposal information.

Procedure



1. Mass 6 g of sucrose and pour into a small container.
2. Mass 1 g of sodium bicarbonate and also pour into the small container.
3. Mix dry chemicals in the container.
4. Pour sand, approximately 170 g, into the evaporating dish.
5. Measure 30 mL of isopropyl alcohol into a 50 mL graduated cylinder.
6. Carefully add the isopropyl alcohol over the sand making sure to cover all of the sand.
7. Add the mixture of solid chemicals toward the center of sand.
8. With a lighter, ignite the alcohol in the sand.
9. Set a timer and watch a carbon snake form out of the sand.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. The solid products of this reaction may be disposed via Flinn disposal method #26a. The sand can be reused or disposed via Flinn disposal method #26a.

Tips

- Replace sucrose with dextrose and compare reaction speed or density of the carbon snake.
- Add copper chloride or strontium chloride to the solid mixture to add color to the flame.

Discussion

The "snake" consists of mainly carbon that comes from the heated sugar, but which was not volatilized in the flame. The carbon is what makes the snake black. There is also Na_2CO_3 in the snake, which results from the decomposition of the baking soda when heated. The sugar and baking soda snake proceeds according to the following chemical reactions, where sodium bicarbonate breaks down into sodium carbonate, water vapor and carbon dioxide gas; while burning the sugar in oxygen produces water vapor and carbon dioxides gas. The pressure created from the release of the carbon dioxide gas causes the snake to grow. The snake gets its black appearance due to the sugar being caramelized by the heat.

- Combustion of sugar to give carbon dioxide and water vapor:

$$C_{12}H_{22}O_{11}(s) + 12O_2(g) \rightarrow 12CO_2(g) + 11H_2O(g)$$

- Thermal decomposition of sugar to give carbon and water vapor:

$$C_{12}H_{22}O_{11}(s) \rightarrow 12C(s) + 11H_2O(g)$$

- Thermal decomposition of baking soda to give sodium carbonate, carbon dioxide, and water vapor:

$$2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$$

- Ignition of isopropyl alcohol:

$$C_2H_5OH(l) + 3O_2(g) - 2CO_2(g) + 3H_2O(g)$$

The *Carbon Snake Chemical Demonstration Kit* is available from Flinn Scientific, Inc.

Catalog No.	Description
AP9584	The Carbon Snake – Chemical Demonstration kit

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