Sugar^3 Catalyst

Introduction

What is a catalyst? This "sweet" demonstration will shed some light on the topic.

Concepts

- Catalyst
- Activation energy
- Rate of reaction

Background

A catalyst is an agent that modifies and increases the rate of reaction without being consumed in the process. Substances that decrease the rate of a reaction are called inhibitors.

Catalysts help to speed up a reaction by changing the activation energy of the reaction, the minimum energy required for the reaction to occur. The reaction rate is increased when the reaction pathway or mechanism provided by the catalyst has a lower activation energy. Enzymes, which are nature's catalysts, are the most common and most efficient catalysts that have ever been found. Catalysts are also used in industry to provide conditions whereby reactions occur at a faster rate.

Materials

Aluminum foil, 6″ square
Beaker, 250-mL
Bunsen burner or matches
Crucible tongs
Sugar cube
Water
Wood ash

Safety Precautions

Although the materials in this demonstration are considered nonhazardous, please observe all normal laboratory safety precautions. Use caution with the Bunsen burner flame and hot sugar. Wash hands thoroughly after performing laboratory demonstrations. Wear goggles or safety glasses whenever working with chemicals, heat, or glassware in the lab.

Procedure

1. Fill a beaker half-full with water.
2. Light a Bunsen burner or a match.
3. Using crucible tongs, pick up one sugar cube and hold it close to the Bunsen burner or match flame.
4. As the sugar cube starts to melt, hold it up so students can see that it has not started to burn.
5. Place the melted sugar cube on the aluminum foil square.
6. Pick up another sugar cube with the crucible tongs and dip the cube into the wood ash until coated.
7. Hold the coated sugar cube the same distance from the Bunsen burner or match flame as before.
8. As the cube starts to burn, hold it up so students can see that it is burning.
9. Extinguish the burning sugar cube by dunking it in the beaker of water.
10. Provide the burned cube, the melted cube, and an unaltered cube for comparison.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. Materials in this activity may be disposed of according to Flinn Suggested Disposal Method #26a, in the regular trash after they have cooled completely.

Publication No. 10730
061616

Connecting to the National Standards

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

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Content Standards: Grades 5–8
Content Standard B: Physical Science, transfer of energy
Content Standard C: Life Science, structure and function in living systems
Content Standards: Grades 9–12
Content Standard B: Physical Science, chemical reactions
Content Standard C: Life Science, the cell, biological evolution; matter, energy, and organization in living systems

Tips

- Wood ash may be found in a fireplace. An alternative would be to burn some paper and to use the resulting ash, or fine carbon powder as the catalyst.
- As each sugar cube is heated above 185 °C, hot sugar may drip. Place aluminum foil under the demonstration area to catch droplets. Use caution to avoid being burned.
- The sugar cube could be set on a fireproof surface and lit with a match instead of being held with the tongs.

Discussion

In this demonstration the ash acts as a catalyst that lowers the activation energy, the energy needed to start the reaction, and the sugar cube burns at about the same temperature it melted at initially. The ash is not consumed in the reaction.

Materials for *Sugar^3 Catalyst* are available from Flinn Scientific, Inc.

Catalog No.	Description
AP5344	Bunsen Burner, Adjustable, Natural Gas
AP8266	Crucible Tongs
AP2037	Matches, Wood, Box
C0201	Charcoal Powder, Fine, 100 g

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