Production of Sodium Carbonate Lab

Decomposition Reactions

Introduction

As baking soda (sodium bicarbonate) is heated strongly, the following chemical reaction occurs.

sodium bicarbonate → sodium carbonate + carbon dioxide + water

The balanced chemical equation appears as follows.

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

In this laboratory activity, students will be assigned a target mass of sodium carbonate. It is their job to determine the amount of sodium bicarbonate needed to produce that amount without any excess.

Concepts

- Decomposition reaction
- Stoichiometry

Materials

- Sodium bicarbonate, $NaHCO_3$
- Balance, 0.01 g precision
- Bunsen burner
- Clay triangle
- Crucible
- Ring, support, 2″
- Spatula
- Support stand

Safety Precautions

The materials used in this activity are considered nonhazardous. Students should exercise caution when working with the burner and hot crucible. Follow all laboratory safety guidelines. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Each lab group will be given a target mass of sodium carbonate from the instructor.
2. It is the students job to use stoichiometry to determine how much sodium bicarbonate they will need to decompose to obtain the target mass they were assigned.
3. Set up a balance at the front of the class.
4. Once students have finished decomposing sodium bicarbonate instruct them to come to the front of the class and mass their sodium carbonate product.
5. Once the experimental mass is determined students should write a complete lab report including their data and percent yield for the reaction as well as other standard criteria.

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory wastes. The sodium carbonate produced in this lab may be diposed of in the regular trash according to Flinn Suggested Disposal Method #26a.

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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
Constancy, change, and measurement
Content Standards: Grades 5–8
Content Standard B: Physical Science, properties and changes of properties in matter
Content Standards: Grades 9–12
Content Standard B: Physical Science, chemical reactions

Reference

Figueira, A. R.; Coch, J.; Zepica, M. J. Chem. Educ. 1988, 65, 1060.

McCamish, M. J. Chem. Educ. 1987, 64, 710.

Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Production of Sodium Carbonate Lab* activity, presented by Jeff Bracken, is available in *Decomposition Reactions* and in *Jeff Bracken Challenge Labs*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

Materials for *Production of Sodium Carbonate Lab* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0043	Sodium Bicarbonate, 500 g

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