Investigation 6
How Can the Waste Be Made Useful?

Introduction

Many chemical processes involve the production of byproducts that may not have immediate use. Because of the impact these substances may have on the environment in their disposal, chemists try to reduce their production, use processes that produce environmentally innocuous substances, or turn them into products that have practical use. In this investigation your group will work with some solutions of substances that when combined may have some practical use.

Suppose your team of savvy investigators has been hired by a chemical waste disposal company. For a substantial fee, the company collects large volumes of waste solutions. As much as possible, waste treatment companies try to concentrate the solutions. In addition, solid waste is easier to dispose of than solutions. As an alternative to disposal, the company thinks that it can generate more revenue by producing something useful from its acquired solutions. Your job is to design procedures for making useful solids from a list of solutions. These solids can then be sold by the company for additional profit.

Goals

As you complete this investigation, you will:
1. Become acquainted with the solubility rules for ionic compounds.
2. Use the solubility rules to design syntheses of several ionic compounds.
3. Separate the solid product from the solution.

Materials

0.1 *M* solutions of $AgNO_3$, $Mn(NO_3)_2$, $BaCl_2$, HCl, NaOH, H_2SO_4, $Zn(NO_3)_2$, $Al(NO_3)_3$, and Na_2CO_3
Test tubes
Centrifuge and/or filtration equipment
Well plates (if available)
Droppers
Other supplies by request

Getting Started

Your instructor will assign the solids your group will study. You will design experiments for the synthesis and separation of your assigned solids. These solids must be prepared from the solutions supplied by the chemical waste company. On completion of your syntheses you should present the pure solids to your instructor for inspection. The presence of other ions would be considered a contamination of the solid.

All of the acquired waste solutions consist of dissolved ions. You may want to consult the solubility rules in Appendix J to determine whether your assigned solids are water soluble. Information about filtration and centrifugation in Appendix G may be of some use. For each solid determine how much product is obtained.

Report

The report must be typed and grammatically correct. It may be returned to you for corrections if it is not acceptable. Your report should include thorough discussions of your syntheses, complete with chemical equations. Molecular, complete ionic, and net ionic equations may be useful in describing the chemistry involved in your syntheses. In addition, your report should include recommendations for possible uses of the solids your group synthesized so the chemical waste company can identify potential customers.

Caution:
While working in the laboratory wear your goggles at all times. You are working with strong acids and bases that can cause permanent damage to eyes and skin.