Chemistry II - Laboratory #1
Determination of the Percentage of Water in a Hydrate

Goal

The goal of this lab is to determine the percent of water in hydrated aluminum potassium sulfate (alum).

Topics to Include in Research

hydrates, percent composition, water of hydration, alum

Example Problems to Work and Explain in Research

- Washing soda is a hydrated compound whose formula can be written $Na_2CO_3 \cdot x\ H_2O$. When a 2.123 g sample of washing soda was heated to 130 °C, all of the water of hydration was lost, leaving 0.787 g of the anhydrous compound. Calculate the value of x and name the original hydrate.
- What is the percent of water in $CuSO_4 \cdot 5\ H_2O$?
- What is the literature percentage of water in hydrated aluminum potassium sulfate? (You may calculate it yourself or list a source–your choice.)

Background

If an aqueous solution which contains $[Al(H_2O)_6]^{3+}$ ions, potassium ions, and sulfate ions is evaporated, the compound aluminum potassium sulfate (alum) crystallizes. With the alum crystal, six waters of hydration are bonded directly to the aluminum ion to give $[Al(H_2O)_6]^{3+}$ ions, while the others surround the potassium ion.

Guidelines

1. Use 2.50 grams of aluminum potassium sulfate.
2. Heat the hydrate very gently on a low flame to avoid splattering any of the hydrate. Once any bubbling has stopped, increase the temperature gradually for two or three minutes. Strongly heat (red-hot) the crucible for at least five minutes.
3. In your calculations section, include how you calculated your sample's percentage of water and your percent error.

Lab handout based on the experiment "Analysis of Alum" in Laboratory Experiments for Advanced Placement Chemistry (Second Edition) by S.A. Vonderbrink (Flinn Scientific, 2006)