The Synthesis of Potassium Trisoxalatoferrate(III) Trihydrate

Introduction

A useful technique in all areas of chemistry is that of synthesis. This technique is important because it is the basis for developing new chemicals that may make life easier for animals and vegetation. Most developments in the pharmaceutical industry as well as the introduction of new and less harmful pesticides are made possible because the chemicals involved are synthesized and tested in the laboratory. In addition, many chemicals used in everyday life are synthesized from simpler materials.

Today's experiment involves preparing a substance by reacting known quantities of chemicals. The expected product is $K_3Fe(C_2O_4)_3 \bullet 3H_2O$, potassium trisoxalatoferrate(III) trihydrate. Knowing the chemical reaction for its formation, you can do rudimentary calculations concerning the synthesis process. The balanced chemical equation is given below.

$$FeCl_3\,(aq) + 3\,K_2C_2O_4 \bullet H_2O\,(aq) \rightarrow K_3Fe(C_2O_4)_3 \bullet 3H_2O\,(s) + 3\,KCl\,(aq)$$

Procedure

1. First you will prepare the ferric chloride solution. Weigh about 2-3 g (to the nearest mg) of solid $FeCl_3$ and dissolve in 20.00 mL of deionized water. You will need to calculate the molarity of this solution later.

For the remainder of this procedure, you should do two simultaneous trials. You will use the same solution of ferric chloride for both trials.

2. Weigh about 3-4 g (to the nearest mg) of potassium oxalate monohydrate, $K_2C_2O_4 \bullet H_2O$. Record the exact value.

3. Dissolve the weighed potassium oxalate monohydrate in 10 mL of deionized water. Heat gently to dissolve, but **do not** boil.

4. Add 5.00 mL of your ferric chloride solution to the hot potassium oxalate solution.

5. Cool to approximately 0°C in an ice bath. Keep at this temperature until crystals have completely formed, approximately 15 minutes after the first crystals are seen with the naked eye.

6. Carefully decant the supernatant liquid, leaving the crystals behind. Redissolve the crystals in another 15 mL of warm (about 50°C) deionized water. Allow the solution to cool again to about 0°C. Let the solution recrystallize at this temperature for at least 20 minutes.

7. Collect the crystals by filtration using a Buchner funnel. Wash the product with cold water twice. Finally, rinse with two 5-mL aliquots of cold methanol.

8. Transfer the product to a piece of dry, weighed filter paper. Allow the product to air dry in your drawer until the next lab period. In the meantime, determine the limiting reagent and theoretical yield for each trial.

9. Weigh the dry precipitate during the next lab period and complete your calculations.

10. Report your results as the average % yield.

Name

Data and Results

	Trial One	Trial Two
Mass of ferric chloride		
Molarity of ferric chloride solution		
Volume of ferric chloride solution used in reaction		
Moles of ferric chloride used in reaction		
Mass of potassium oxalate monohydrate		
Moles of potassium oxalate used in reaction		
Mass of dry filter paper		
Mass of filter paper and product after drying		
Mass of product		
Limiting reactant		
Theoretical yield of product in grams		
Actual yield of product in grams		
% yield		
Average % yield		

Calculations

Show all your calculations in this space. Use the back of the page if needed. Be sure to include units and use the appropriate number of significant figures.