Experiment 5

Synthesis und Analysis uff ein Complex Iron Compound

Part 1: Synthesis

CH 204 Fall 2007

Dr. Brian Anderson

Last Veek

Standardizing a solution

Acid/Base titration

moles H^+ = moles OH^-

moles acid x # of H^+ = moles base x # of OH^-

Calculating moles by $\frac{\text{grams}}{\text{MW}}$ and Molarity x Volume

Three-week experimental adventure quest!

This week: Synthesis of a potassium oxalatoferrate salt.

$K_x[Fe_y(C_2O_4)_x]\cdot zH_2O$

Series of reactions

Starting material $\longrightarrow$ $\longrightarrow$ $\longrightarrow$ $\longrightarrow$ Product

"Precursors", "Intermediate products"

Next two weeks: Qualitative identification of the compound through quantitative analysis of oxalate and iron.

Was ist potassium oxalatoferrate?

Oxa-who?

An ionic crystal with a big, covalently-bound anion.

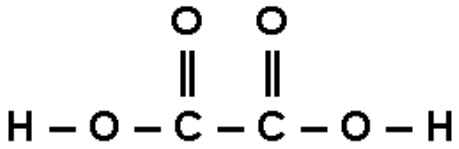
$K_x[Fe_y(C_2O_4)_x]\bullet zH_2O$

Cation: K^+

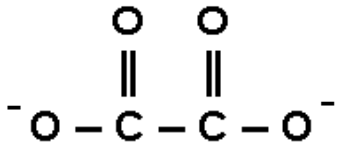
Anion: $Fe_y(C_2O_4)_x^{x-}$

dot

Waters of hydration



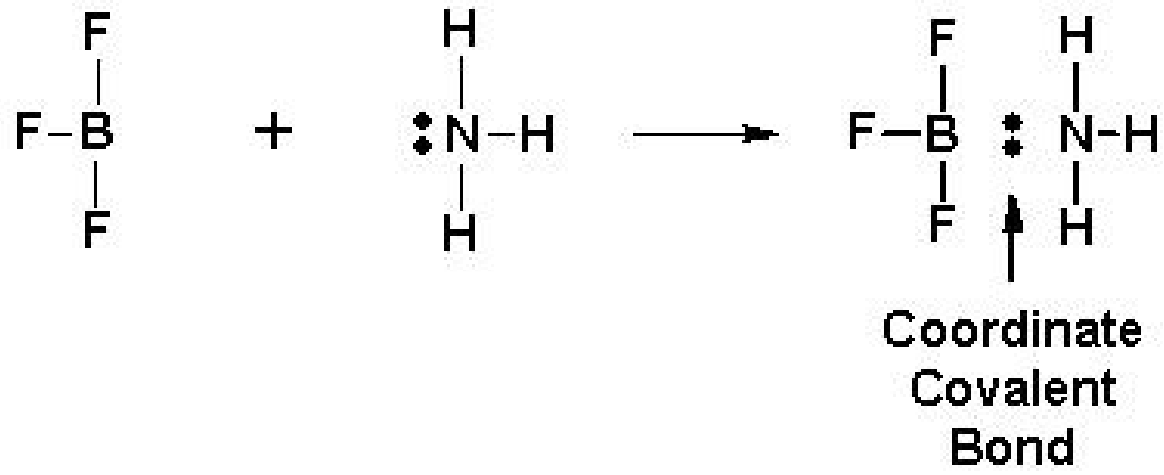
Oxalic acid



Oxalate ion

Coordinate Covalent Bonds

Coordinate covalent bond: two shared electrons in a bond, but *both electrons come from the same atom*.



Our compound will have **coordinate covalent bonds** between the central iron^{+3} ion and the oxygen atoms in oxalate.

Procedure Overview

- Dissolve an Fe^{2+} salt in water and add oxalic acid to precipitate the iron as a yellow solid, Iron (II) Oxalate. (Steps 1-8)

- Oxidize the iron to Fe^{3+} in the presence of excess oxalate. The precipitate will dissolve as the complex ion forms in solution. (Steps 9 – 12)

- Precipitate the iron complex ion as a green crystal by adding ethanol to the mix. (Steps 13 – 15)

WARNING!

Follow lab directions carefully or there will be

no sparkly green crystalline delight for you!

(And this will make you cry.)

Do NOT overheat solutions in the lab today!

Potassium oxalate ≠ Oxalic acid!

If crystals don't form in the end, slowly add up to 10 ml more of ice-cold ethanol.

Grading this lab

- No real data to speak of, so not the usual lab report
- Record your observations during the experiment – precipitation, color changes, evolution of gases, dissolving of precipitates. You will be graded on these!
- Discussion questions count for more points this time

Hit the road, Jack!

I will be out of town Wednesday through Friday of this week.

And again next week. And on Thursday and Friday the week after that.

So I won't have office hours on Wednesday, but you can go to
Dr. Leytner's office hours on Thursday 4:00 to 5:00
in Welch 5.220B.

I will have e-mail access in the evenings.

Post-lab 5 overview

Theoretical yield and limiting reagent problems typically follow the same three-step procedure:

You are given the number of grams of a reactant, and are asked the number of grams of product.

Step 1: grams of A $\rightarrow$ moles of A

Step 2: moles of A $\rightarrow$ moles of B

Step 3: moles of B $\rightarrow$ grams of B

Pre-lab 6 preview

Question 5: Determining oxidation states.

Not there yet in 302, and it's not in the lab manual.

Look at the help sheet on the Freebies page of the class web site:

http://courses.cm.utexas.edu/banderson/ch204/freebies.html

Final Exam Part 4

There are 9 parts total, and we count the best 8.

After today you are almost halfway done with the final exam.

The next few quizzes will test you on the same kind of material the post-labs cover. Make sure you understand how to do the post-labs!