Experiment 5

Synthesis und Analysis of ein Complex Iron Compound

Part 1: Synthesis

CH 204 Fall 2009

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Last Week

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 odyssey adventure!

This week: Synthesis of a potassium oxalatoferrate salt.

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

Starting material $\xrightarrow{\text{Series of reactions}}$ 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.

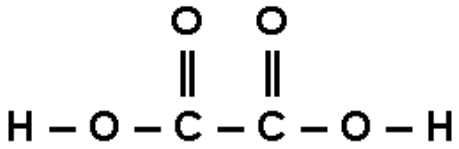
$K_x[Fe_y(C_2O_4)_x]\bullet zH_2O$

Cation: K^+

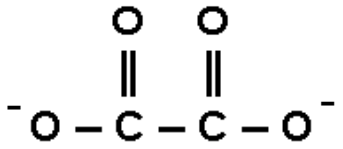
Anion: $Fe_y(C_2O_4)_x^{x-}$

dot

Waters of hydration



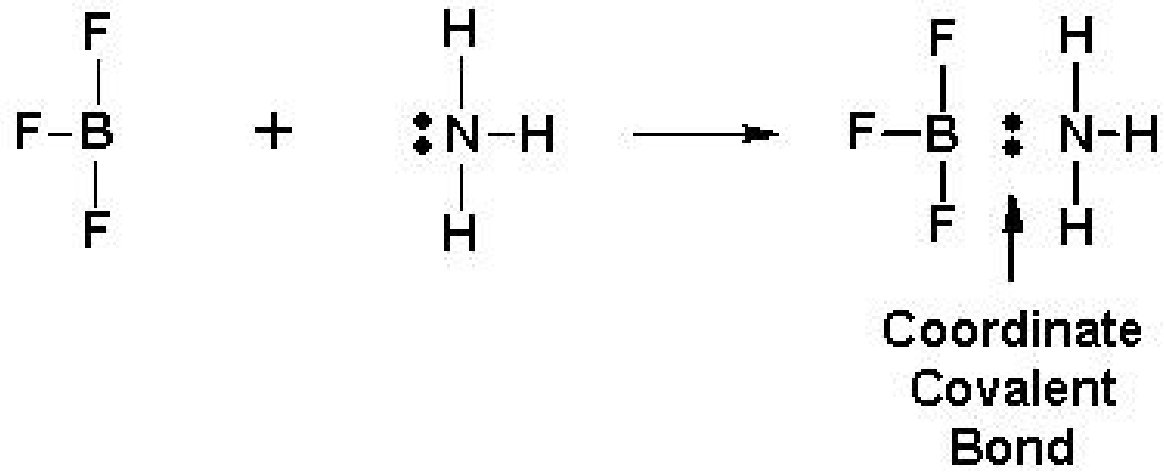
Oxalic acid



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 that will make you cry.)

Do NOT overheat solutions in the lab today!

Potassium oxalate ≠ Oxalic acid!

Add ethanol SLOWLY.

Grading this lab

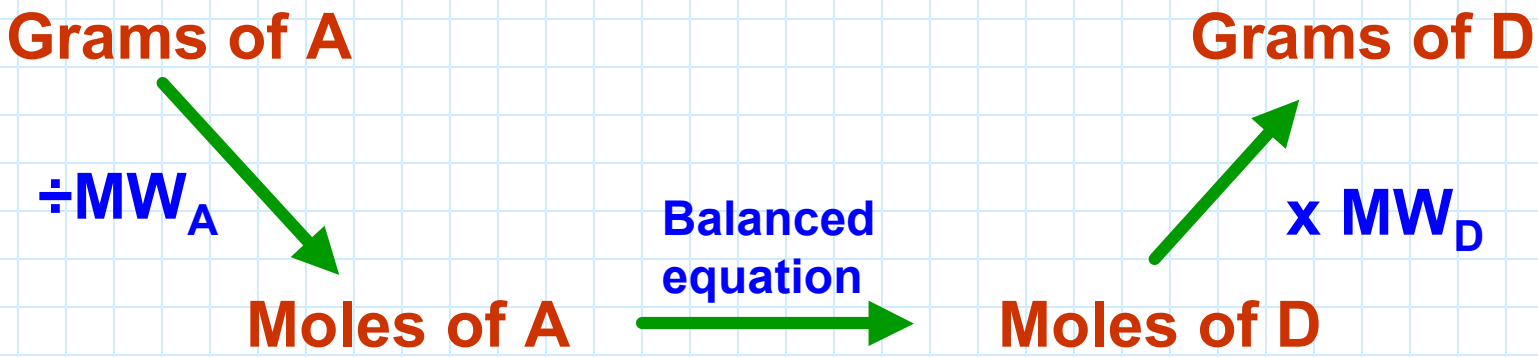
- No real data to speak of, so not the usual lab report
- Record your observations during the experiment – precipitation, color changes, evolution of gases, dissolving of precipitates. You will be graded on these!
- Discussion questions count for more points this time

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 (A), and are asked for the number of grams of a product (D).

$$A + B \longrightarrow C + D$$



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 always have at least one question similar to the post-lab questions. Make sure you understand how to do the post-labs!