

Experiment 5

Synthesis und Analysis uff ein Complex Iron Compound

Part 1: Synthesis

CH 204 Fall 2008

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Last Week

Standardizing a solution

Acid/Base titration

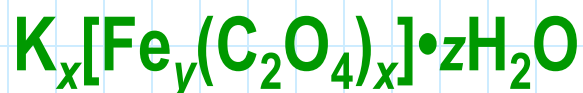
$$\text{moles H}^+ = \text{moles OH}^-$$

$$\text{moles acid} \times \# \text{ of H}^+ = \text{moles base} \times \# \text{ of OH}^-$$

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

Three-week experimental adventure quest!

This week: **Synthesis of a potassium oxalatoferrate salt.**



Series of reactions

Starting material \longrightarrow \longrightarrow \longrightarrow \longrightarrow Product

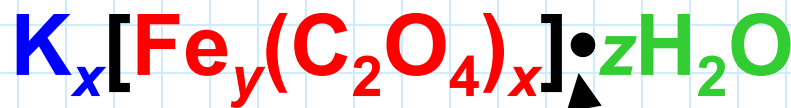
"Precursors", "Intermediate products"

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

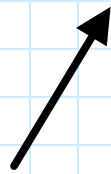
Was ist potassium oxalatoferrate?

Oxa-who?

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



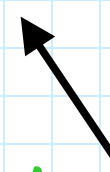
Cation: K^+



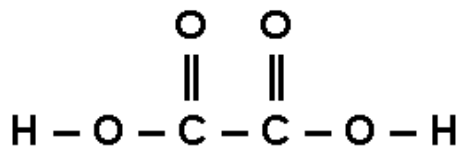
dot



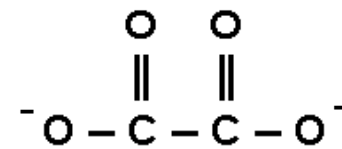
Waters of hydration



Anion: $\text{Fe}_y(\text{C}_2\text{O}_4)_x^{x-}$



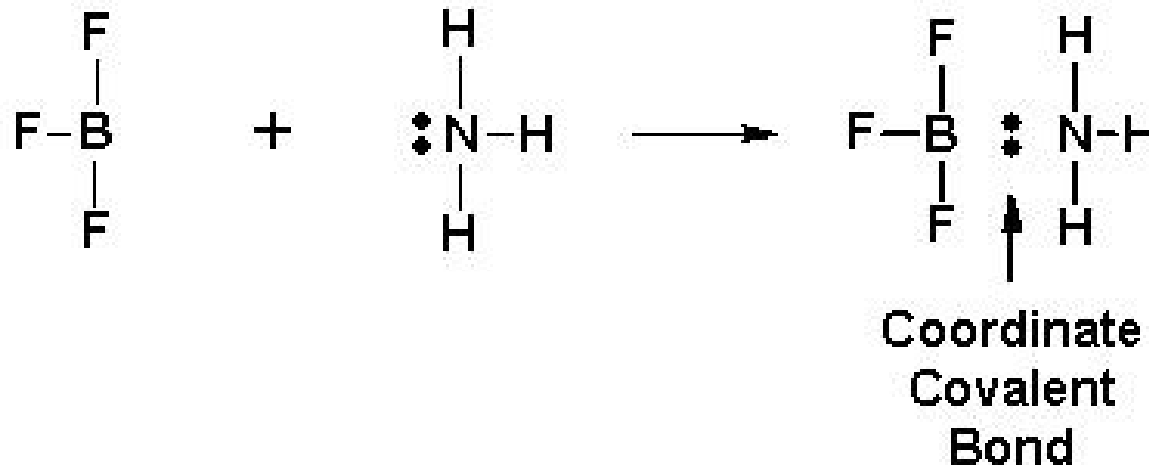
Oxalic acid



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 \neq Oxalic acid!

If crystals don't form in the end,
slowly add more ice-cold ethanol.

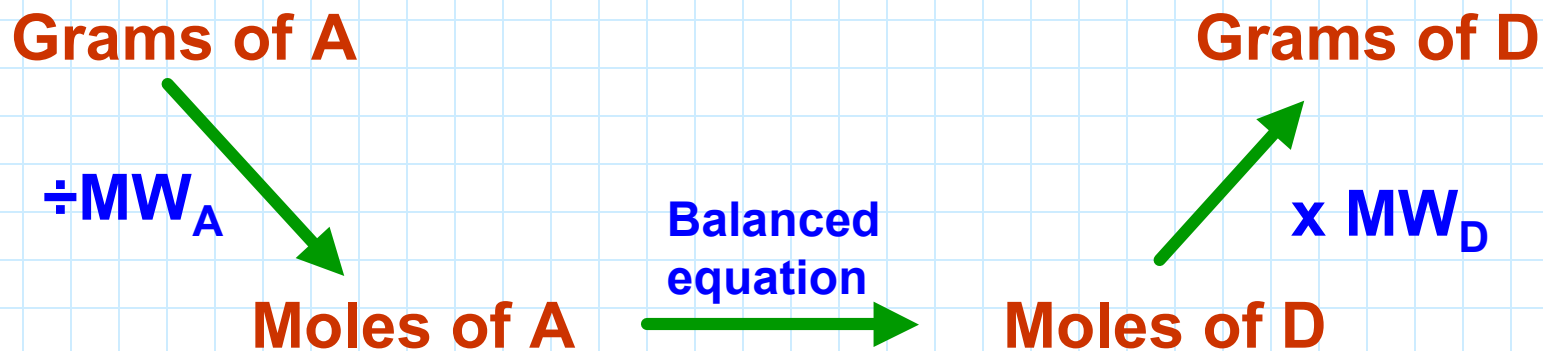
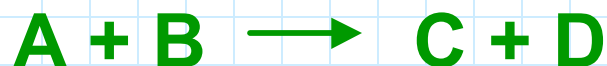
Grading this lab

- 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

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).



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!