Qualitative Analysis of CaC_2O_4 & $NaCo(NN)_3$

Ramina Bella & Ciara Blanco
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Purpose

In this experiment, we applied previous knowledge in reactions in order to identify two cations in an unknown solution.

Background

We gathered information about 9 different cations and their observable reactions to specific reagents.

Background Continued

$Mg(NO_3)_2 + Na_2HPO_4$

Starts: clear and colorless
Ends: cloudy white, white precipitate

$Al(NO_3)_3 + NaOH$

Starts: clear and colorless
Ends: cloudy white, white precipitate, jelly-like

$Fe(NO_3)_3 + KSCN$

Starts: clear and yellow
Ends: blood red, no precipitate

$Mn(NO_3)_2 + NaBiO_3$

Starts: Clear and colorless
Ends: clear, forms brown precipitate

$Ba(NO_3)_2 + Na_2SO_4$

Starts: Clear and colorless
Ends: pearl white, white precipitate

Background Continued

$Ca(NO_3)_2 + (NH_4)_2C_2O_4$

Starts: Clear and colorless
Ends: pearl white, white precipitate

$Cu(NO_3)_2 + KI$

Starts: Clear and light blue
Ends: yellow-brown, sludge-like

$Ni(NO_3)_2$ + dimethyl glyoxime

Starts: Clear and light green
Ends: pink/red, formed precipitate

$Co(NO_3)_2$ + 1-nitroso-2-naphthol

Starts: Clear and pinkish red
Ends: dark red, formed precipitate

Experimental Procedure

- Our solution began as a pinkish-red
- **Rxn 1:** HNO_3 and NH_3 were mixed with our solution, it turned beer like in color and did not form any precipitate. No aluminum, iron, or manganese is present. We can now focus on the right side of the flow chart.
- **Rxn 2:** $(NH_4)_2CO_3$ is mixed solution from rxn 1, becomes a grapefruit like color of pinkish red. A precipitate forms, which we centrifuge and decant. The liquid is a bright purple.
- **Rxn 3:** Our decanted liquid from rxn 2 is mixed with Na_2HPO_4, becoming a deeper purple, no precipitate is formed meaning it does not have magnesium.

Experimental Procedure

- **Rxn 9:** HCl is mixed with solid b. It turns a very light pink color, meaning either Ba^{2+} or Ca^{2+} is in the substance.
- **Rxn 10:** Na_2SO_4 is mixed with the substance from rxn 9, it remains a clear color and no precipitate forms. This means that the substance contains Ca^{2+} and no Ba^{2+}.
- **Rxn 11:** $(NH_4)_2C_2O_4$ is mixed with the substance from rxn 10. The solution forms a white precipitate, meaning our first cation is $\mathbf{CaC_2O_4}$.

Experimental Procedure

- **Step 12:** The liquid from rxn 3 is evaporated until dry, leaving a solid behind. The powder left is a purple color.
- **Rxn 13:** H_3PO_4 is mixed with the powder. The formed liquid is a light see through pink once the powder fully dissolves.
- **Rxn 14:** Na_2HPO_4 is mixed with the solution from rxn 13. It remains a see through pink with no precipitate.
- **Rxn 15:** KI is mixed with solution from rxn 14. No change occurs, meaning it is not CuI.
- **Rxn 16**: $C_4H_8N_2O_2$ is mixed with solution from rxn 14. No change occurs, meaning it is not $NiC_8H_{14}N_4O_4$
- **Rxn 17:** $C_{10}H_6(NO)OH$ is mixed with solution from rxn 14. It turns a deep blood like red, becomes sticky in texture, and forms precipitate. Our second cation is $\mathbf{NaCO(NN)_3}$.

Summary & Conclusion

We utilized previous knowledge about the appearance and consistency of nine different cations when reacted with specific reagents to determine the identify of two unknown cations in an unknown solution. After following the flowchart and conducting a series of tests, we determined the possible presence of Ca^{2+} and CO^{2+} in our unknown solution.