TITLE: Gravimetric analysis of a chloride salt

CHEM 1101

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Purpose: The purpose of this experiment was to determine the amount of chloride in an unknown salt sample.

Theory: AgCl is very insoluble, and will precipitate out of solution when silver ions (Ag+) and chlorine ions (Cl-) interact. The original salt is very soluble, and in addition, chloride is removed by the silver precipitation, allowing for more to dissolve. AgCl does have a low Ksp (1.6\*10^-10), so some will be lost to the solution.

Procedure:

* 0.1112g of the unknown salt was weighed.
* A clean and dry sintered glass filter crucible was obtained.
* 100mL distilled water, the salt sample, and 1 mL of 6M HNO3 were added to a 250mL beaker. It was mixed with a glass stirring rod until the salt completely dissolved.
* The calculated amount of AgNO3 was added to the beaker, then heated.
* The beaker was cooled in a dark place.
* Transfer the supernatant to the crucible in the assembled filtration apparatus.
* HNO3 was added to wash the precipitate, then the whole mixture was added to the crucible.
* The precipitate within the crucible was repeatedly washed, until no more silver ions were present within the washings. This was verified by adding HCl to the wash, which should show no turbidity.
* The washings were emptied from the filtration apparatus, then the precipitate was rewashed with acetone 3 times.
* The precipitate and crucible were dried in a furnace for about 30 minutes.
* The crucible was cooled in a desiccator, then weighed. The final mass was recorded.

Observations:

The sample number was 342, and the sample was a white powder.

While the beaker was on the hotplate, some of the precipitate had become tinted slightly blue/purple.

The precipitate after was slightly purple lumps.

While testing for completeness, there was no additional precipitation when adding AgNO3, and no turbidity when HCl was added to the washing.

Data:

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| |  |  |  |  | | --- | --- | --- | --- | | Data |  |  | Uncertainties | | Starting mass | 13.1000 | g | ±0.0001g | | Final mass | 12.9888 | g | ±0.0001g | | Difference | 0.1112 | g | ±0.0001g | |  |  |  |  | |  |  |  |  | |  |  |  |  | | AgNO3 Required | 21.86 | mL | ±0.15mL | | AgNO3 Used\* | 22.22 | mL | ±0.15mL | |  |  |  |  | | Crucible mass before | 30.7375 | g | ±0.0001g | | Crucible mass after | 31.1220 | g | ±0.0001g | |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | Partner's Data |  |  | Uncertainties | | Starting mass | 13.2087 | g | ±0.0001g | | Final mass | 13.1003 | g | ±0.0001g | | Difference | 0.1084 | g | ±0.0001g | |  |  |  |  | |  |  |  |  | |  |  |  |  | | AgNO3 Required | 0.02144 | mL | ±0.15mL | | AgNO3 Used\* | 0.02181 | mL | ±0.15mL | |  |  |  |  | | Crucible mass before | 32.6819 | g | ±0.0001g | | Crucible mass after | 32.9067 | g | ±0.0001g | |  |  |  |  |

The oven was 122.1 degrees Celsius, and the crucible was in it for 30 minutes. The crucible was cooled for 10 minutes afterwards. The uncertainty for the times is 20 milliseconds.

Calculations:

See attached sheet.

Discussion:

The design of the experiment itself allows for fairly accurate determination of chlorine content within water soluble salts. The Ksp of AgCl is very low, so tiny amounts would have been lost in the small amounts of water used.

The largest factor in why the calculated value was much higher than the value within the salt is because an accident spilled a large amount of the precipitate. Attempting to recollect the scattered precipitate may have introduced some debris which could increase the mass. Other, smaller factors include:

While heating the solution, I may have stirred it too vigorously. This can cause the formation of elemental silver which would have increased the final mass.

Small amounts would be lost through solution, washing and escaping though the crucible.

Conclusion:

In this experiment, we tested sample #342. The calculated value was wildly inaccurate, at 85.53%, vs the known value of 53.83%.