

Gravimetric analysis of sulphate



General Aim

To determine the percentage (by mass) of sulphate in an unknown sulphate salt by gravimetric analysis.

Method

Gravimetric quantitative analysis of sulphate in a salt.

Learning Objectives (ILOs)

- Explain the principle of gravimetry.
- Enumerate the steps of gravimetry
- To learn the techniques associated with gravimetric analysis.
- To use stoichiometry to calculate the percentage by mass of sulfate in an unknown sulphate salt.
- Propose a gravimetric method for the analysis of different salts based on knowledge gained from this experiment.

Theoretical Background/Context

- Gravimetric analysis is a quantitative method for accurately determining the amount of a substance by selective precipitation of the substance from an aqueous solution. The precipitate is separated from the remaining aqueous solution by filtration and is then weighed.
- The principle behind gravimetric analysis is that the mass of an ion in a pure compound can be determined and then used to find the mass percent of the same ion in a known quantity of an impure compound.

In order for the analysis to be accurate, certain conditions must be met:

1. The ion being analyzed must be completely precipitated.
2. The precipitate must be a pure compound.
3. The precipitate must be crystalline and easily filtered.

Theoretical Background/Context (Cont')

The steps of gravimetric analysis include:

1. Precipitation

a. Colloidal ppt

- Tiny particles pass through filter paper.
- Show no tendency to settle from a solution.

b. Amorphous ppt

- Large surface area.
- Aggregates of nuclei easily transform into colloidal state.

c. Crystalline ppt

- Particles with large size.
- Tend to settle spontaneously.
- Easily washed and retained on the filter paper.

*Obtained by precipitation from hot dilute solution with stirring and adding the precipitating agent slowly dropwise.

2. Ageing (crystal growth)

- Happens when a freshly formed precipitate is left in the solution from which it precipitates.
- It results in cleaner and bigger particles.

3. Filtration

- Done by decantation or using ash-less filter paper.

4. Washing

- To remove surface adsorbed impurities.

5. Drying ($< 250\text{ }^{\circ}\text{C}$) Or Ignition ($> 250\text{ }^{\circ}\text{C}$ - $1200\text{ }^{\circ}\text{C}$).

6. Weighing

7. Calculation

Principle of Work

In this experiment you will determine the percentage (by mass) of sulphate in an unknown sulphate salt by gravimetric analysis. Sulphate salt is precipitated by barium chloride as barium sulphate. After filtration and drying the precipitate, calculations should be made to determine the percent of sulphate in the sample.