Gravimetric Analysis

Gravimetric analytical methods are based on accurate and precise mass measurements. They are used to determine the amount or percentage of a compound or element in a sample material. For example, if we want to determine the percentage of iron in an ore or the percentage of chloride ion in drinking water, gravimetric analysis would be used.

A gravimetric procedure generally involves reacting the sample to produce a reaction product that can be used to calculate the mass of the element or compound in the original sample. For example, to calculate the percentage of iron in a sample of iron ore, determine the mass of the ore. The ore is then dissolved in hydrochloric acid to produce $FeCl_3$. The $FeCl_3$ precipitate is converted to a hydrated form of Fe_2O_3 by adding water and ammonia to the system. The mixture is then filtered to separate the hydrated Fe_2O_3 from the mixture. The hydrated Fe_2O_3 is heated in a crucible to drive the water from the hydrate, producing anhydrous Fe_2O_3. The mass of the crucible and its contents is determined after successive heating steps to ensure that the product has reached constant mass and that all of the water has been driven off. The mass of Fe_2O_3 produced can be used to calculate the mass and percentage of iron in the original ore sample.

Gravimetric procedures require accurate and precise techniques and measurements to obtain suitable results. Possible sources of error are the following:

1. The product (precipitate) that is formed is contaminated.
2. Some product is lost when transferring the product from a filter to a crucible.
3. The empty crucible is not clean or is not at constant mass for the initial mass measurement.
4. The system is not heated sufficiently to obtain an anhydrous product.

GENERAL SAFETY

Always wear safety goggles and a lab apron to protect your eyes and clothing. If you get a chemical in your eyes, immediately flush the chemical out at the eyewash station while calling to your teacher. Know the location of the emergency lab shower and eyewash station and the procedure for using them.

When using a Bunsen burner, confine long hair and loose clothing. Do not heat glassware that is broken, chipped, or cracked. Use tongs or a hot mitt to handle heated glassware and other equipment; heated