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## What is the aim of titrimetric analysis

**What is the aim of titration. What are the types of titrimetric analysis. What is the aim of titration experiment. What is titrimetric analysis.**

The methods of titrimetric analysis are subdivided according to the titration variant and by those chemical reactions that are chosen for the determination of the substance (component). In modern chemistry, quantitative and qualitative analysis is distinguished. Types of classification Methods of titrimetric analysis are selected for a specific chemical reaction. Depending on the type of interaction, there is a subdivision of titrimetric determination into individual species. Methods of analysis: Oxidation-reduction titration; The method is based on a change in the oxidation state of the elements in the substance. Complexation is a complex chemical reaction. Acid-base titration assumes complete neutralization of interacting substances. Neutralization Acid-base titration allows to determine the amount of inorganic acids (alkalimetry), and also to calculate the bases (acidimetry) in the desired solution. According to this method, substances that react with salts are determined. Using organic solvents (acetone, alcohol), it became possible to determine more substances. Complexation What is the essence of the method of titrimetric analysis? The determination of substances is proposed by precipitation of the desired ion as a sparingly soluble compound or its binding into a malodisociated complex. Redoximetry Oxidation-reduction titration is based on the reactions of reduction and oxidation. Depending on the titrated solution of the reagent used in analytical chemistry, there are: Permanganometry, which is based on the use of potassium permanganate; Iodometry which is based on oxidation by iodine, and also restoration iodide-ions; Dichromatometry, which uses potassium dichromate oxidation; Bromatometry, based on the oxidation of potassium bromate. Oxidation-reduction methods of titrimetric analysis include also such processes as cerimetry, titanometry, vanadometry. They assume the oxidation or reduction of ions of the corresponding metal. By the method of titration There is a classification of methods for titrimetric analysis, depending on the method of titration. In the direct version, the detected ion is titrated with a selected reagent solution. The titration process in the substitution method is based on the definition of an equivalence point in the presence of unstable chemical compounds. Titration on the remainder (the inverse method) is used when it is difficult to select an indicator, as well as when the chemical interaction proceeds slowly. For example, in the determination of calcium carbonate, the sample of the substance is treated with an excess of titrated hydrochloric acid solution. Value of analysis All methods of titrimetric analysis assume: Accurate determination of the volume of one or each of the reacting chemicals; Presence of a titrated solution, through which the titration procedure is performed; Revealing the results of the analysis. Titration of solutions is the basis of analytical chemistry, so it is important to consider the basic operations performed during the experiment.

| Gravimetric vs Titrimetric Analysis  |   |  |
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|  | Gravimetric Analysis  | Titrimetric Analysis   |
| DEFINITION   | Gravimetric analysis is a technique that comes under quantitative analysis where we can determine the weight of an unknown compound in a sample | Titrimetric analysis is a type of quantitative analysis in which we can measure the amount of an unknown compound using its volume |
| TECHNIQUE  | Measuring the weight of the unknown   | Measuring the volume of the unknown  |
| UNIT OF MEASUREMENT  | Usually kilograms (kg)  | Usually litres (L)   |
| BASIC CHEMICAL REACTION  | Precipitation reaction  | Redox reaction   |

This section is closely related to everyday practice. Having no idea about the presence of the main components and impurities in the raw material or product, it is difficult to plan the technological chain in the pharmaceutical, chemical, and metallurgical industries. Fundamentals of analytical chemistry are used to solve complex economic issues. Methods of research in analytical chemistry This branch of chemistry is the science of determining a component or substance.

The fundamentals of titrimetric analysis are the methods used for the experiment. With their help, the researcher makes a conclusion about the composition of the substance, the quantitative content of the individual parts in it. It is also possible in the course of analytical analysis to reveal the degree of oxidation in which the constituent of the substance under study is located. When classifying methods of analytical chemistry, take into account what kind of action is expected to be performed. To measure the mass of the resulting sediment, a gravimetric method of investigation is used. When analyzing the intensity of the solution, photometric analysis is necessary. By the magnitude of the emf by potentiometry, the components of the test drug are determined. The titration curves clearly demonstrate the ongoing experiment. Division of analytical methods In case of need in analytical chemistry use physical-chemical, classical (chemical), and also physical techniques. By chemical methods it is customary to understand titrimetric and gravimetric analysis. Both methods are classical, well-developed, widely used in analytical chemistry. Weight (gravimetric) method involves the determination of the mass of the desired substance or its constituent components, which are isolated in the pure state, as well as in the form of insoluble compounds. The volumetric (titrimetric) method of analysis is based on determining the volume of a reagent consumed by a chemical reaction taken in a known concentration.

There is a subdivision of chemical and physical methods into separate groups: Optical (spectral); Electrochemical; Radiometric; Chromatographic; Mass spectrometric.

| Titrimetric Methods of Analysis   |
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| • based upon measuring the amount of reagent of known concentration (SR) that is consumed by the analyte (A)<br>$aA + bSR \rightarrow cP$ |
| • widely used for routine analyses because they are rapid, convenient, accurate and readily automated                                     |

| Titrimetric Methods of Analysis  |
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| 1. Volumetric Titrimetry involves measuring the volume of a solution of known concentration that is needed to react exactly completely with the analyte.   |
| 2. Gravimetric Titrimetry allows one to find mass of the reagent is consumed instead of its volume.  |
| 3. Coulometric Titrimetry the "output" is a constant direct electrical current of known magnitude that directly or indirectly reacts with the analyte, the time required to complete the electrochemical reaction. |

Specificity of titrimetric study This section of analytical chemistry involves measuring the amount of reagent that is required to conduct a complete chemical reaction with a known amount of the substance sought. The essence of the technique is that a reagent with a known concentration is added dropwise to the solution of the test substance. Adding it continues until the amount of it is equivalent to the amount of the detectable substance reacting with it. This method allows for high-speed quantitative calculations in analytical chemistry. As the founder of the technique, the French scientist Gay-Lusaka is considered. The substance or element defined in a given sample is called the substance to be determined. Among them there may be ions, atoms, functional groups, bound free radicals. Reagents are gaseous, liquid, solid substances that react with a certain chemical substance. The titration process consists in adding one solution to the other with constant mixing. An obligatory condition for successful implementation of the titration process is the use of a solution with an established concentration (titrant). For the calculations, the normality of the solution is used, that is, the number of gram equivalents of the substance contained in 1 liter of the solution. The titration curves are plotted after the calculations. Chemical compounds or elements interact with each other in clearly defined weight amounts corresponding to their gram equivalents. Variants of preparation of the titrated solution according to the sample of the starting substance As the first method of preparing a solution with a given concentration (determined by the titer), it is possible to consider dissolving a sample of an exact mass in water or another solvent, as well as diluting the prepared solution to the required volume. The titer of the obtained reagent can be determined from the known mass of the pure compound and by the volume of the prepared solution. Such a technique is used to prepare titrated solutions of those chemicals that can be obtained in pure form, the composition of which does not change with prolonged storage. For weighing of used substances, bugs with closed lids are used. Such a method of preparing solutions is not suitable for substances with increased hygroscopicity, as well as for compounds that interact chemically with carbon monoxide (4). The second technology of preparation of titrated solutions is applied at specialized chemical enterprises, in special laboratories.

### NORMALITY:

- The number of gram equivalent of solute present in a litre of the solution is known as normality of the solution.
- Normal solution (1 N) Seminormal solution (N/2)
- Decinormal solution (N/10) Centinormal solution (N/100) Pentanormal solution (5N) Decanormal solution (10N)

### MOLARITY:

- The number of the moles of solute present in a litre of the solutions is known as molarity of the solutions

It is based on the use of solid, pure compounds, measured in exact amounts, and also on the use of solutions with a certain normality. Place the substances in glass ampoules, then they are sealed. Those substances that are inside the glass ampoules are called fixanals. At direct carrying out of experiment the ampoule with a reagent is broken above a funnel which has a punching device. Further, the entire component is transferred to a volumetric flask, then the necessary volume of working solution is obtained by adding water. A certain algorithm of actions is also used for titration. The burette is filled with the finished working solution to zero mark so that in its lower part there are no air bubbles. Further, the solution to be analyzed is pipetted, then it is placed in a conical flask. Add a few drops of the indicator to it.

#### Titrimetric Analysis

The term **titrimetric analysis** refers to quantitative chemical analysis carried out by determining the volume of a solution of accurately known concentration which is required to react quantitatively with a measured volume of a solution of a substance to be determined. The solution of accurately known concentration is called standard solution

Gradually, a working solution is added dropwise from the burette to the prepared solution, followed by a change in color. When a stable color appears, which does not disappear after 5-10 seconds, the completion of the titration process is judged. Then proceed to calculate, calculate the volume of the spent solution with a given concentration, draw conclusions on the experiment. Conclusion Titrimetric analysis allows to determine the quantitative and qualitative composition of the analyte. This method of analytical chemistry is necessary for various industries, it is used in medicine, pharmaceuticals. When choosing a working solution, it is necessary to take into account its chemical properties, as well as the ability to form insoluble compounds with the substance being studied.