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THE USE OF CHROMATOGRAPHIC METHODS IN DETERMINING THE COMPOSITION OF SUBSTANCES IN SCHOOL CHEMISTRY LESSONS

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Abstract
This article covers the use of chromatographic methods for determining the composition of substances in school chemistry lessons and its science, scope, purpose and objectives.

Keywords: Chemistry, methods, chromatographic, analysis, classification, ion exchange.

Chromatography is currently the most widely used method of studying environmental objects. The chromatographic method was proposed in 1903 by the Russian scientist M.S. Tsvet. He wrote: "When filtering the mixed solution through the adsorbent column, the pigments ... are stratified in the form of separate, variously colored zones. Like light rays in the spectrum, the various components of a complex pigment are naturally distributed one after another in the adsorbent column and become available for qualitative determination. I called such a colored preparation a chromatogram, and the corresponding method of analysis by chromatographic method. Works M.S. Colors served as the foundation for the development of other types of chromatography for the separation of both colored and unpainted compounds carried out in any media.

General descriptions of chromatographic analysis methods

Aggregate state of moving and non-moving phases of chromatographic analysis methods, separation mechanism, and classification according to the technique of operation, aggregate of the sample principle of choice of chromatographic analysis method according to its condition and properties, Methods for obtaining chromatograms (frontal, squeezing).The main magnitudes of the chromatogram.

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Chromatography is used for the analysis of complex multicomponent mixtures. Chromatographic methods determine the qualitative and quantitative composition of organic substances, including volatile hydrocarbons and biological fluids. Pharmaceuticals, medicine, oil refining complex, chemical production and other industrial sectors use chromatographs to control the quality of raw materials and finished products, and also ensure compliance with environmental safety standards with their help.

Chromatographic analysis methods are based on cyclic sorption-desorption acts occurring between a mobile phase (eluent) with a dissolved sample and a stationary sorbent. The components of complex mixtures have different sorption properties, and passing along the stationary phase, they are absorbed at different rates and in different amounts. The subsequent study of the results and their comparison with the standard allows us to establish the exact composition of the reagent.

In the traditional method, a material with a developed surface is used as a stationary phase, and an inert gas or liquid stream acts as an eluent. Filtration of the eluent through the sorbent layer triggers multiple repetition of sorption and desorption, which distinguishes chromatographic analysis methods from other analytical techniques and determines their effectiveness.

QUALITATIVE AND QUANTITATIVE ANALYSIS

Chromatographic methods of analysis establish the qualitative and quantitative composition of the substance. During qualitative tests, the sample is identified by its chromatogram, comparing the obtained parameters with the reference values stored in the data library.

The quantitative method of analysis is based on the measurement of peaks formed depending on the concentration of impurities. The laboratory assistant studies the chromatogram using one of the following methods:

The method of absolute calibration. The dependence of the peak parameters on the concentration of different substances is determined experimentally. Then graphs and tables are compiled, with which the chromatogram is subsequently compared. Due to its simplicity and high accuracy, the method is the main one for detecting trace impurities.

The method of internal normalization. The sum of the selected peak parameters (for example, their height or area) is taken as 100%. Next, the ratio of the height of the individual peak under study to the total value is calculated, thereby determining the mass fraction of a particular component in the sample.

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The method of the internal standard. A standard substance is introduced into the mixture, for which a calibration schedule is known in advance. Then the peaks of the studied components are compared with the peaks of the "standard". The method is used in the case of the study of compositions with a variable, but a known number of analyzed components.

The methods are constantly being refined and improved, which makes it possible to obtain more accurate data when analyzing complex mixtures and to level out noise on chromatograms.

CLASSIFICATION OF CHROMATOGRAPHIC ANALYSIS METHODS

Chromatographic methods are divided into several groups depending on the parameters being compared. According to the aggregate state of the phases , chromatographic analysis methods are divided into:

Gas-liquid. The mobile phase is an inert gas flow that passes through a liquid sorbent.

Gas adsorption. A sample in a gaseous state is passed through a solid substance on the surface of which adsorption is carried out.

Liquid-liquid. Liquid media are used as the eluent and the stationary phase.

Liquid-adsorption. The reagent is fed together with the solvent and passes through a solid porous material.

Liquid-gel. In this method, the stationary phase is represented by a gel-like substance.

The second classification concerns the design of chromatographic equipment. In most methods, a column chromatograph is used: adsorption is carried out in columns filled with a stationary phase. But sometimes planar chromatography is used, in which a thin slice of sorbent or special paper is used. Also recently, the capillary chromatographic method has become widespread, in which separation occurs in a liquid film, and chromatography in fields, which requires the creation of additional magnetic, centrifugal or other forces for analysis.

Chromatographic methods of analysis differ in the features of the interaction of the eluent and adsorbent. According to the separation mechanisms , chromatography is divided into:

adsorption — based on the difference in the adsorbability of the sample components;

distributive — proceeds due to the different solubility of substances in phases;

ion exchange — is carried out by achieving ion exchange equilibrium constants;

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penetrating — based on the difference in the shapes and sizes of molecules;
sedimentary — occurs due to the deposition of insoluble compounds;
adsorption-complexing — is performed due to the formation of coordination compounds of different strengths on the surface of the stationary phase.
The following classification divides chromatographic methods of analysis into three groups according to the methods of moving the absorbed components along the adsorption layer. There are manifestation (or eluent), frontal and displacement methods.

ION EXCHANGE CHROMATOGRAPHIC METHOD

The ion exchange chromatography method is based on the replacement of elementary particles included in the reagent with atoms contained in the ion exchanger. Therefore, the effectiveness of the analysis depends on the parameters of the equipment used. Modern ion exchangers have important advantages:
High exchange capacity.
Reproducible ion exchange properties.
Resistance to acids and alkalis, any strong oxidizing agents.
For their production, various polymer compounds are most often used: for example, polystyrene with a different set of functional groups that determine the characteristic properties of the finished material.
The ion exchange chromatographic method is used mainly for the separation of elementary particles, after which it is possible to carry out a quantitative calculation of the analyzed components. This technology is used to detect a variety of anions in drinking and industrial water, processed products, food, pharmaceutical and chemical raw materials. The most indicative method for determining the cations of alkaline and alkaline earth metals, and substituted ammonium salts.

REFERENCES

1. Y.A. Zolotov, E.N. Dorokhova, V.I. Fadeeva and others. In 2 books. Fundamentals of Analytical Chemistry M., Higher School, 1999,
2. Rudenko B.A., Rudenko G.I. Highly efficient chromatographic processes. In 2 volumes. Moscow:Nauka, 2003.
3.Shpigun O.A., Zolotov Yu.A. Ion chromatography. Moscow: MSU, 1990.
4. Rudakov O.B., Vostrov I.A., Fedorov S.V., Filippov A.A., Selemenev V.F., Pridantsev A.A. Satellite of the chromatographer. Methods of liquid chromatography. Voronezh: Aquarius, 2004.

ISSN: 2776-0987 Volume 4, Issue 5 May 2023

5. Mario. Ion exchangers in Analytical Chemistry. M., Mir 1985, In two volumes (foreign lit. translation), 545c.
6. Bonchev, Introduction to analytical chemistry. M. Chemistry, 1978.
7. Methods of detection and separation of elements (Practical guide). M.: 1984.