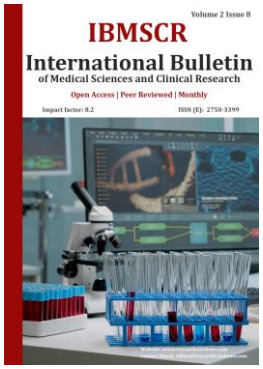

DEVELOPMENT OF LIQUID DETERGENT TECHNOLOGY BASED ON POTASSIUM CARBONATE AND BIOCARBONATE

Orinbaev Talasbay Nietbaevich
Master's student of Tashkent Institute of Chemical Technology.
Toirov Zokir Kalandarovich
Scientific leader:
Associate Professor of the Tashkent Institute of Chemical Technology
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Annotation. The chemical industry is a basic industry that is closely interconnected with all sectors of the economy. The industry's production should be based on high technologies, and the products manufactured according to the nomenclature should meet international standards. Therefore, the development of the chemical industry is a priority task of the modern development of the economy of the Republic of Uzbekistan.

One of the main directions of Uzbekistan's economic development is the development of natural resources, their integrated use and the creation of competitive import-substituting products based on local raw materials.

Keywords: potassium carbonate, biocarbonate, differential thermal method, mass fraction, liquid detergents, leukometer, photometer.

The solubility of water-salt systems was studied by the isothermal method by mixing solutions of the studied salts at a constant temperature while maintaining a sufficient number of solid phases in the mixture.

The experiments were carried out in a parabolic flask with a stirrer placed in a thermostat, the temperature in which was maintained by a thermostat and a contact thermometer with an accuracy of ± 0.1 ° C.

After the equilibrium was established, samples of the liquid and solid phases were taken for chemical analysis and the location of the figurative point of the system was determined. The solid phase was determined by the Scrainemakers residue method.

When carrying out the research, potassium chloride of the ch.d.a. brand was used, additionally purified by recrystallization from an aqueous solution and KS1 qualification and ch.d.a.

In the study of water-salt systems, carbonate and sodium and ammonium chloride qualifications were used, respectively, "h" and "ch.d.a.".

Isothermal solubility diagrams of quadruple systems were studied on a rectangular quadrangle. The concentration of solutions is expressed in mass percentages and Ineke indices.

Characteristics of the analysis methods.

Identification of products was carried out by X-ray phase, infrared spectroscopic, microscopic methods. Currently, infrared spectroscopy has become one of the main physical methods of research in chemistry, with the help of which it is possible to solve problems of qualitative and quantitative analysis of matter and to judge the structure of molecules.

The pH of the solutions was measured using an EV-74 ionomer. The phase composition of solid products was studied using thermogravimetry, radiography and IR spectroscopy.

The differential-thermal method of phase analysis is based on the independence of the temperatures of thermal transformations of individual components of the mixture under study. Quantitative thermal analysis was performed on a derivatograph of the Paulik and Erdei system (MOM, Budapest) with the sensitivity of the galvanometers DTA-1/10 and DTG-1/15. The weight of the substance was 200-300 mg . The analyses were carried out in quartz crucibles. The standard was calcined aluminum oxide.

This method of studying substances makes it possible to establish the presence of certain atomic groups and their location in the molecule reflects the specific features of the structure of the substance, being a kind of fingerprint card.

IR spectra were taken on a bi-beam spectrometer IR-20 in the range of 400-3600 cm-1. Samples for recording spectra were prepared using the method of compressing the substance in potassium bromide.

X-ray phase analysis is based on the fact that the radiograph of the sample is the sum of the radiographs of the individual phases.

X-ray phase analysis was carried out on a DRON-3 diffractometer with a voltage of 35 kW, an anode current through a tube of 8 mA with a maximum speed of the intensifier counter 400 mm p/s.

Infrared spectroscopy is especially widely used for structural group analysis. Due to the simplicity and automation of obtaining spectra, the infrared spectroscopy method has found wide application in scientific laboratories and serves as a reliable source of control in chemical production.

The infrared spectrum of a chemical compound is one of its most important characteristics. Therefore, the study of the resulting finished product was carried out in the infrared region of the spectrum using the NICOLET Magna 560 IR spectrometer. The analysis was performed under the following conditions: range 4000-600cm-1, scan number – 64, aperture – 17 and scan speed – 0.6329.

Preparation of the sample for analysis was carried out by tableting micro quantities of the test substance with potassium bromide. Then their IR spectra were recorded.

Modern electron microscopes have a useful magnification of up to 300,000 times, which allows you to see particles with a size of 3-5 • 10-10 meters (3-5 A). Such a deep penetration into the world of small particles became possible as a result of the use of electron beam microscopy, the waves of which are many times shorter than the waves of visible light.

Method for determining the mass fraction of potassium carbonate or bicarbonate. A suspension of 7.0 ± 0.5 g of synthetic detergent is placed in a beaker with a capacity of 100 cm3, dissolved in 40-50 cm3 of water and transferred to the reactor, thoroughly rinsing the glass with water. Then such a volume of water is poured so that the bent end of the glass tube is in solution. 2-3 drops of methyl orange and 40 cm3 propanol-2 are added to the resulting solution. 40 cm3 of dilute hydrochloric acid (1:5 solution) is poured into the funnel 6 with a cylinder. 100 cm3 of barium hydroxide solution, 5 cm3 of chloroform are poured into the absorption flask 3 with a pipette, 2-3 drops of phenolphthalein are added and a magnet is placed from the agitator. 40 cm3 of propanol-2 and 20 cm3 of dilute hydrochloric acid (solution 1) are poured into the receiving flask 4 with a cylinder:5) (Fig. 2.1). They turn on a magnetic stirrer, a microcompressor, creating a small vacuum in the system with a syringe, pour hydrochloric acid in small portions until the color of the solution in the reactor changes from yellow to pink.

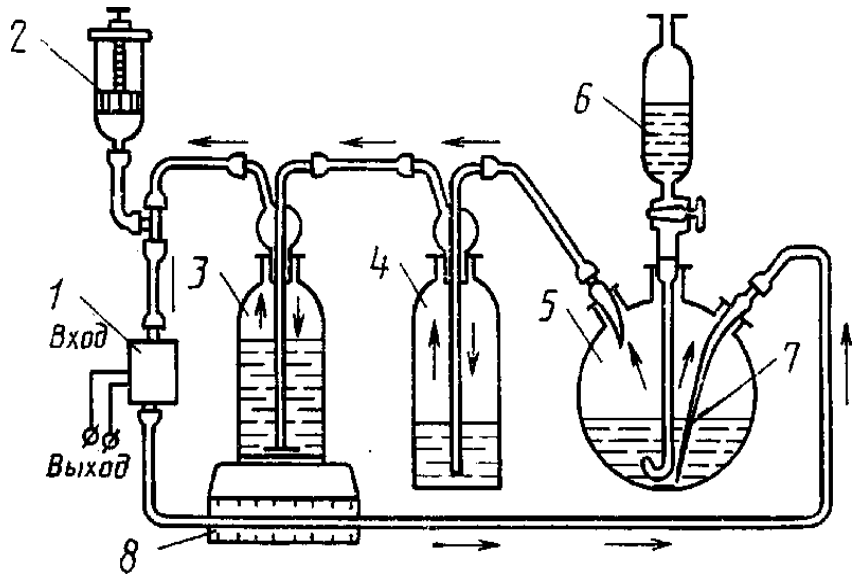

Fig.1. Device for determining the mass fraction of carbon dioxide. The arrows show the direction of air circulation

After changing the color of the solution, an excess of hydrochloric acid (3-4 cm3) is added. In the process of adding hydrochloric acid with a syringe, a small vacuum is created in the system. The resulting gas mixture should circulate for 15 minutes.

Then turn off the microcompressor, open the absorption flask 5, turn on the magnetic stirrer and filter the excess of barium hydroxide with a solution of hydrochloric acid concentration c (HC1)= 0.1 mol/dm3 (0.1 n.) in the presence of phenolphthalein. Titration should be carried out immediately after opening the system to avoid absorption of carbon dioxide from the air.

Determination of stability in hard water . A solution for analysis containing 50 g of surfactant in 1000 cm3 of water is prepared, dissolution is carried out at 20 ° C. If substances dissolve with difficulty at 20 ° C, then they are dissolved at 50 ° C. The temperature is indicated in the test report.

A 5.0 cm3 solution is pipetted for analysis, placed in one of the test tubes and a Si hard water solution is added to a volume of 50 cm3.

By mixing the analysis solution with a hard water solution, foam formation is avoided. To do this, close the tube containing the mixture with a hand or a cork, slowly tip it over and turn it back to the initial position. This operation is repeated 10 times.

The test tube is left alone for at least 1 hour and no more than 2 hours at (20 ± 2) ° C, at this temperature it is determined whether a precipitate, turbidity or opalescence has formed. If it is found that the solubility of calcium salts increases with increasing temperature, the analysis is carried out at (50 ± 3) ° C.

Also, the determination is carried out with 2.5; 1.2; 0.6 and 0.3 cm3 of the analyzed solution. All samples of the analyzed solution are tested in the manner described above with hard water solutions S2 and S3.

If there are possible fluctuations between the two estimates (for example, turbidity and a small sediment), put the worst estimate. An opaque liquid through which objects are discernible is considered opalescent.

An opaque liquid through which objects cannot be distinguished is considered cloudy.

Methods for determining the mass fraction of active oxygen. Weigh 10 g of a laboratory sample with an error of up to 0.01 g. Place the sample in a beaker with a capacity of 2000 cm3.

Fill a measuring flask with a capacity of 1000 cm3 to the mark with water at a temperature of 36-40 ° C and pour water to the sample, giving it the opportunity to drain from the walls of the flask for several seconds. Vigorously stirred with a mechanical stirrer for 3 minutes until the sample is dissolved, except for a small amount of insoluble silicates, etc. (solution L1).

During dissolution, a solution of sulfuric acid is poured into a conical flask with a capacity of 500 cm3, 50 cm3 and a solution of potassium permanganate is added drop by drop, constantly stirring, until a stable pale pink color appears.

Using a pipette, 100 cm3 of L1 solution is collected and transferred to a conical flask. Titrate with a solution of potassium permanganate until a pale pink color appears, stable for at least 15 seconds. If the end point is not clearly expressed, repeat the determination in the presence of 1 g of aluminum sulfate or using 20 cm3 of sulfuric acid solution.

Method for determining bulk density. The powder is poured into a cylinder with a funnel in a smooth stream without shocks, to the line inside the cylinder. If there is no specified feature in the cylinder, then the powder is not poured into the cylinder for 1 cm. The filled cylinder is placed on the filler cylinder with the funnel down and the funnel flap is opened. After pouring the powder into the storage cylinder, the cylinder with the funnel is removed.

The knife is quickly removed from the measuring slot without shaking the device, and after the load and powder fall into the measuring, the knife is again inserted into the slot with the same precautions. The measure together with the filler cylinder is removed from the socket of the case, overturned, holding the knife and the filler cylinder, and the remaining powder is poured on the knife. The filler cylinder is removed and the knife is removed from the measuring slot.

The measure with the powder is weighed with an error of no more than 0.5 g.

A method for determining stability. Two test tubes with a capacity of 40 cm3 are filled with 2/3 of the volume of the tested synthetic detergent and weighed with an error of no more than 0.01 g. The permissible discrepancy between the masses of test tubes with powder should not exceed 0.1 g.

The tubes filled with powder are kept in a thermostat for 20 minutes at 40 ° C, after that they are installed in the sockets of the centrifuge rotor and centrifuged for 10 minutes. Centrifugation on the TSUM-1 centrifuge is carried out with a rotor speed of 4000 rpm.

The method of determining the color. The sample of the test powder is thoroughly mixed, ground in a mortar and sifted through a sieve.

A mirror glass is placed on the surface of the table, not less than the size of the cuvette, on which the cuvette is installed with a larger diameter opening upwards. The cuvette is filled with powder to two-thirds of its height. The powder is thoroughly compacted with a sealer.

The surface of the powder adjacent to the mirror glass is used for measuring and should be smooth.

The leukometer and photometer FO-1 are prepared for operation in accordance with the instructions attached to the devices.

The adjustment of the leukometer is carried out according to a control or certified working sample of reflection on blue and red light filters.

The adjustment of the photometer FO-1 is carried out according to the control sample of the reflection of ONS-1 No. 2-2 or ONS-1 No. 2 on light filters 457 and 612 nm.

The sample cuvette is mounted on the sample holder and with the help of a clamping device is brought under the light-measuring hole.

Method of determination of flowability [93]. General-purpose laboratory scales of the 3rd or 4th accuracy class according to GOST-24104, with the maximum weighing limit of 1 kg.

The inner surface of the funnel is wiped with a dry cloth until the dust particles on its surface are removed. The funnel is fixed vertically in the tripod, excluding vibration during the measurement process.

Clean dry sieves with square cells of 0,800 and 0.560 mm are installed on a pallet in order of increasing the size of the cells.

A weight of sand weighing (500 ± 5) g is placed on the upper sieve, closed with a lid and sand is sifted manually. The completeness of sand sieving is controlled by triple additional shaking.

The isolated fraction of sand from a 0.560 mm sieve is transferred to a glass or a conical flask.

The characteristics of the funnel are checked once a month.

The flowability of powdered synthetic detergent (X) as a percentage is calculated by the formula

$$X = \frac{T * 100}{T_1}$$

where T is the expiration time of the standard sand, with;

T1 is the expiration time of the tested powdered synthetic detergent, C.

The arithmetic mean of three parallel definitions is taken as the final test result, the permissible maximum deviation from the average should not exceed 10%.

Method for determining the foaming capacity. A suspension of a synthetic detergent weighing 5 g for powdered, pasty and liquid detergents and weighing 3 g for foaming detergents and the corresponding 5 g of active substance for shampoos, taken with an error of no more than 0.01 g, is placed in a beaker, dissolved in 50-60 cm3 of hard water prepared according to claim 3.1, stirred until completely dissolved funds. The dissolution of powdered and pasty synthetic detergents is carried out when heated to (60 ± 5) ° C.

The resulting solution is placed in a flask or cylinder, the volume of the solution is brought to 1000 cm3 with hard water and mixed, avoiding foaming.

The preparation of the solution is carried out at a test temperature with a tolerance of ± 5 ° C. For each experiment, at least 2 dm3 of the solution should be prepared. The solution is prepared no later than 30 minutes and no earlier than 2 hours before the test.

The foaming capacity is determined on the Ross-Miles device at (50 ± 2) ° C, for powdered, pasty and liquid detergents and (37 ± 2)°C - for foaming detergents and shampoos.

The correction factor is calculated by the formula:

$$K = \frac{D_1}{2500}$$

where D1 is the actual inner diameter of the test device, mm;

2500=(50)2 - the inner diameter of the tube of a standard device squared.

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