

METHODS OF OBTAINING AND PURIFICATION OF DISPERSED SYSTEMSA.Zh. Yessimbekova 

*Secondary school with preschool mini-center of Oyan village, Karatal district,
Zhetysu region, Republic of Kazakhstan*
*e-mail: aynur_esimbekova@mail.ru

In the article, when teaching chemistry in the 10th grade, it is considered that modern colloidal chemistry is the science of dispersed systems and surface phenomena. In the process of teaching chemistry, it is necessary to pay attention to the most important characteristics of the dispersed system, which are the basis of the heterogeneity and dispersion of the processes taking place. Students should learn that heterogeneity and the presence of two or more phases determines the presence of a phase interface with excess energy compared to volume and, as a result, specific properties and phenomena on the surface. Defines the surface area as a measure of the separation of the dispersed phase and the proportion of surface properties in the overall properties of the system.

Keywords: *colloidal chemistry, dispersed system, dispersed phase, rosin, molecule, emulsion.*

Introduction

Dispersed systems, where the particle sizes of the dispersed phase depend on specific solutions and condensed bodies. Therefore, dispersed systems can be used in the study of chemistry in two ways:

- crushing of the body to a dispersed size;
- molecules of solutes in real solutions can combine to form particles of dispersed size.

The student must learn that the first method is called the dispersion method (grinding, crushing), and the second is the condensation method.

When the body is crushed by the dispersion method, the body is first deformed and then destroyed. Therefore, the work performed for grinding can be divided into two types: the so-called work spent on deforming the body and creating a new surface. The deformation work is directly proportional to the volume:

$$W_{\text{деф}} = kV$$

Where k is the proportionality coefficient; V is the volume of the substance. The work performed to create a new surface is equal to:

$$W_{\text{б}} = \delta\Delta S$$

Where δ is the surface tension; S is the area of the newly formed dividing surface. Then the total amount of work performed on the grinding of the substance will be equal to:

$$W = W_{\text{деф}} + W_{\text{б}} = kV + \delta\Delta S$$

If we take into account that the volume is proportional to the cube of the radius of the fraction, and the surface area is equal to the square of the radius, then the above ratio can be written as:

$$W = k_1 r^3 + k_2 \delta r^2$$

Where k_1 and k_2 are the coefficients of proportionality; r is the radius of the particle.

The body size is very large in bolgan $k_1 r^3 \gg k_2 \delta r^2$. At the same time, you can ignore the amount of work spent on creating a new surface. If this is the case, the work of shredding the body will be approximately equal to:

$$W = k_1 r^3$$

Therefore, the amount of total work in this case is mainly determined by the amount of work spent on deforming the body.

When the body size is less than $k_1 r^3 \ll k_2 \delta r^2$, the amount of work spent on deforming the body can be ignored. If this is the case, the work of shredding the body will be approximately equal to:

$$W = k_2 \delta r^2$$

Therefore, the total amount of work is mainly determined by the cost of the work spent on creating a new page.

Surfactants are often used to reduce the amount of work performed when grinding the body. Then the molecules of the surfactant are adsorbed on the surface of the solid, which leads to a decrease in its surface tension. If this is the case, then, according to the tender, the amount of work performed on body polishing is reduced. This phenomenon is called the rule of reducing body strength (Rebinder effect) as a result of Rebinder adsorption.

Most often, drug dispersed and microheterogenic systems are obtained by dispersion. It is not possible to obtain colloidal solutions by dispersion. Grinding is carried out using various mills. For this purpose, both ball mills (with balls for grinding inside) and jet mills can be used. The grinding process can also be implemented using ultrasound.

Materials and methods

When teaching chemistry at school, the teacher pays special attention to the fact that the condensation method itself is divided into two parts: physical and chemical. During physical condensation, the solubility of a substance decreases in the process of changing the temperature, composition of the solution or properties of the system, as a result of which the molecules of the solute combine together to form dispersed particles. For example, when you pour water into an alcohol solution of rosin, its molecules combine because rosin does not dissolve well in water, which leads to hydrolysis of rosin.

During chemical condensation, a poorly soluble substance is formed in a dispersed medium (water), and its molecules together form dispersed particles.

The experimental part

When teaching students, it is necessary to focus on the use of a general method of condensation of the new phases formed. Where the prerequisites for condensation are: the formation of superman and channel solution and uneven distribution of solute in a dispersed medium, as well as the presence of condensation centers or granules.

Students must master the degree of saturation with solution and water vapor (β) determined by the following tenders:

$$\beta e = \pi \beta e = C/C_s: Bcy = P/P_s$$

Where C is the concentration of the supersaturated solution at the same temperature; P is the pressure of the supersaturated vapor; C_s and P_s are the concentration of the saturated solution at the same temperature and the pressure of the saturated vapor above a flat surface.

The next stage of mastering students is the formation of particles from an oversaturated solution or vapor, changing the chemical potential of the substance and forming a new separating surface. As a result of the formation of a new separation surface, the surface energy of the system increases. And the work on creating a new surface (for spherical particles) is equal to:

$$W_6 = 4\pi r^2 \delta$$

Then the chemical potential of the substance changes as follows:

$$\Delta\mu_{1^+} - \mu_{1^-} < 0; \mu_{1^+} < \mu_{1^-}$$

Where μ_1 is the chemical potential of a substance in a homogeneous phase: μ_1 is the chemical potential of a substance in a heterogeneous phase. The transition of a substance from one phase to another (for example, condensation) occurs due to the difference in its chemical potentials in phases. The amount of matter passing from one phase to another is equal to:

$$n = 4\pi r^3 / 3Vm$$

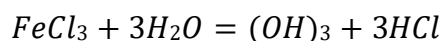
Where Vm is the molar volume of the substance; g is the radius of the particle. Then the amount of total work performed during the formation of a new surface by condensation will be equal to:

$$Wk = W\delta + W_{\text{тас}} = 4\pi r^2\delta + (4\pi r^3 / 3Vm)(\mu_1 - \mu_2)$$

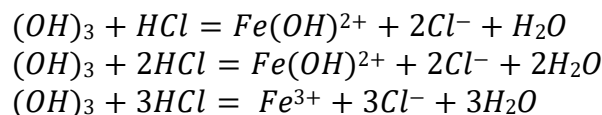
Where Wk is the condensation work; $W\delta$ - is the work on creating a new separation surface; $W_{\text{тран}}$ - is the work of transporting items.

Therefore, for the formation of a new phase, the chemical potential of the component in the homogeneous phase must be greater than its value in the heterogeneous phase. Only then does the phenomenon of phase change occur.

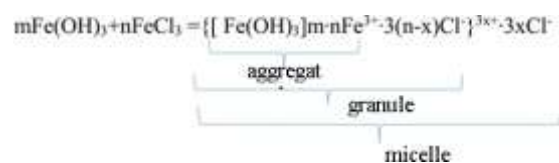
Here are examples of chemical condensation. The formation of a hydrosol of iron (III) hydroxide is carried out by the following reaction:



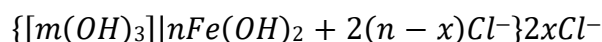
As a result of the reaction, a poorly soluble substance in water is formed - $(OH)_3$. Several hydroxide molecules combine together to form an aggregate. During the reaction, hydrochloric acid is formed, so the acid molecule reacts with hydroxide groups on the surface of the unit, as a result of which the surface of the unit is charged. Then the surface charging process can occur in one of the following three situations:



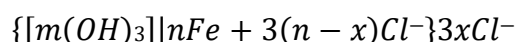
Then the construction of the micelle formed in the first case will be as follows:



In the second case, the structure of the resulting micelle will be as follows:

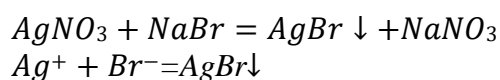


And in the third case, the structure of the resulting micelle will be as follows:

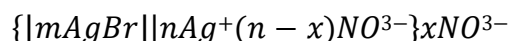


Therefore, the colloidal particles are charged, and the micelle has no charge. The charge gives stability to colloidal particles.

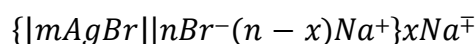
Now consider the formation of silver bromide hydrolysis. It is obtained by adding a solution of sodium bromide to a solution of silver nitrate:



As a result, silver bromide, which is poorly soluble in water, is formed. The structure of the micelle formed during the reaction depends on which of the starting substances is contained in excess. If an excess of $AgNO_3$ is present in the reaction medium, then, according to the Paneta Faience rule, the silver ion cation, which is part of it, is the first to be adsorbed on the surface of the aggregate. As a result, the surface of the solid is positively charged. And the structure of the resulting micelle will be as follows:



If $NaBr$ is in excess in the reaction medium, then, according to the Paneta Faience rule, the bromide ion anion, which is part of it, is the first to be adsorbed on the surface of the unit. As a result, the face is negatively charged. And the structure of the resulting micelle will be as follows:



Dispersing systems are cleaned by dialysis. To do this, the collonde solution is poured into a container from a semiconductor. It is placed in a large container filled with a dispersing medium (water). Then molecules of a dispersed medium (water) and ions easily pass through the semiconductor, but colloidal particles do not. As a result, the ions in the colloidal solution diffuse into a large container, and the concentration of ions in it decreases. Complete purification from the ions contained in the colloidal solution can be carried out, often replacing the liquid in a large vessel.

Methods based on the formation of particles as a result of crystallization or condensation are called condensation. Condensation methods make it possible to obtain dispersed systems from a homogeneous medium. The emergence of a new phase occurs under the influence of saturation of the medium.

Investigation of ways to obtain colloidal systems. Two main methods are used to obtain dispersed systems: dispersion and condensation.

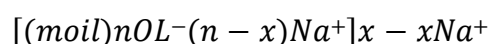
Table 1 – Methods for obtaining particles by size

| № | The dispersed system | Size | The method of obtaining |
|----|------------------------|---------------|-------------------------|
| 1. | The true solution | 10-8 cm | Condensation |
| 2. | Colloidal solution | 10-5 -10-7 cm | Dispersion |
| 3. | Coarse-grained systems | 10-5 cm | |

Explaining the new material, the teacher focuses the main attention of students on dispersion, which is a method of obtaining dispersed systems for crushing or spraying a condensed body. This method includes: mechanical dispersion (rock cracking, stepwise grinding, ball mill, colloidal mill), ultrasonic dispersion, spraying in an electric arc, Peptization (transfer of insoluble soil particles, soil into natural water). The latter is only suitable for a freshly prepared first-time cook. Condensation is a method of obtaining dispersed systems by combining molecules or ions of a substance.

Preparation of an oil emulsion. A test tube (tube) with a volume of 5 ml. pour distilled water, 5-6 drops of the plant into it. shake the cork hard with the addition of oil. The resulting emulsion quickly disintegrates and separates into two layers. Because the droplets merge with each other (coalesce).

The oil drops are intended to be applied as an emulsifier in the presence of sodium oleic acid as follows:



To stabilize the emulsion, a few drops of 1% are added the above-mentioned hydrophilic stabilizer substances, for example, ordinary soap sodium hydroxide or sodium carbonate: fatty acids in the free state and (with the formation of sodium soap) shake the dough repeatedly strongly, resulting in a stable milky white emulsion.

Forecasting and investigation of the direction of physico-chemical processes in dispersed systems. Colloidal chemistry is the science of the physico-chemical properties of dispersed systems and surface phenomena.

Results and discussions

Through to the use of these methods, the teacher gets a great opportunity to learn the role of colloidal systems and colloidal chemical processes in various fields of technology and human activity, as well as the accumulation of theoretical and practical material, it has become independent scientific disciplines. The objects of his study are heterophase systems in which one of the phases is in a highly dispersed (crushed) state.

Conclusion

Initially, colloidal chemistry was considered as a branch of physical chemistry in high school. Over time, based on the analysis of experimental data, this discipline at school became one of the main ones in the study of chemistry. Even research methods of special colloidal chemistry have been discovered: ultramicroscopy, electron microscopy, ultracentrifugation (filtration), electrophoresis and much more.

ӘДЕБИЕТТЕР:

1. Нурушева А.Б. Коллоидтық химиядан зертханалық жұмыстар / А.Б. Нурушева. – Қостанай: ҚМПИ, 2013. – 98 б.
2. Қ.Б. Мұсабеков, Қ.Ж. Әбдиев. Коллоидтық химияның негіздері. Алматы, Қазақ университеті, 2008 ж.
3. Марков В. Ф., Алексеева Т. А., Брусницына Л. А., Маскаева Л. Н. Коллоидная химия : примеры и задачи : [учеб. пособие] / К607 [науч. ред. В. Ф. Марков]; М-во образования и науки Рос. Федерации, Урал. федер. ун-т. – Екатеринбург : Изд-во Урал. ун-та, 2015. – 188 с.
4. Шубенкова Е.Г. Коллоидная химия. Поверхностные явления: практикум / Е.Г.Шубенкова ; Минобрнауки России, ОмГТУ. – Омск : Изд-во ОмГТУ, 2015. – 64 с.
5. Ельцов С.В., Водолазкая Н.А. Физическая и коллоидная химия. Часть II. Коллоидная химия. Учебник по физической и коллоидной химии Харьковского национального университета имени В. Н. Каразина - 240 с. Часть II. Коллоидная химия. Харьков, 2005. - с. 145-240
6. Артамонова И.В., Мартынова Т.В., Плахотная Т.В., Горичев И.Г. Коллоидная химия. Учебное пособие. М.: МГТУ «МАМИ», 2010. 73 с.
7. Белопухова С.Л. Физическая и коллоидная химия : учебное пособие / под ред. С.Л.Белопухова; Российский Государственный аграрный университет - МСХА им. К.А.Тимирязева. – Москва : Проспект, 2016. – 208 с4.
8. Қоқанбаев Ә. Қ. ҚКІ Коллоидтық химия курсы: Беттік құбылыстар, Дисперстік жүйелер: Оқулық. — Алматы: ЖШС «Полиграфкомбинат», 2013. – 656 бет.

REFERENCES:

1. Nuruşeva A.B. Koloidtyq himiadan zerthanalyq jümystar / A.B. Nuruşeva. – Qostanai: QMPI, 2013. – 98 b.
2. Q.B. Mūsabekov, Q.J. Äbdiev. Koloidtyq himianyñ negizderi. Almaty, Qazaq universiteti, 2008 j.
3. Markov V. F., Alekseeva T. A., Brusnisyna L. A., Maskaeva L. N. Koloidnaia himia : primery i zadachi : [ucheb. posobie] / K607 [nauch. red. V. F. Markov]; M-vo obrazovania i nauki Ros. Federasii, Ural. feder. un-t. – Ekaterinburg : İzd-vo Ural. un-ta, 2015. – 188 s.
4. Şubenkova E.G. Koloidnaia himia. Poverhnostnye iavlenia: praktikum / E.G. Şubenkova ; Minobrnauki Rosii, OmGTU. – Omsk : İzd-vo OmGTU, 2015. – 64 s.

5. Elsov C.V., Vodolazkaia N.A. Fizicheskaja i koloidnaja himia. Chäst II. Koloidnaja himia. Uchebnyk po fizicheskoj i koloidnoj himii Härkovskogo nasionälnoġo universiteta imeni V. N. Karazina - 240 c. Chäst II. Koloidnaja himia. Härkov, 2005. - s. 145-240

6. Artamonova İ.V., Martynova T.V., Plahotnaja T.V., Gorichev İ.G. Koloidnaja himia. Uchebnoe posobie. M.: MGTU «MAMİ», 2010. 73 s.

7. Belopuhova S.L. Fizicheskaja i koloidnaja himia: uchebnoe posobie / pod red. S.L.Belopuhova; Rosiski Gosudarstvennyi agrarnyi universitet - MSHA im. K.A. Timiräzeva. – Moskva : Prospekt, 2016. – 208 s4.

8. Qoqanbaev Ä. Q. QK1 Koloidtyq himia kursy: Bettik qūbylystar, Disperstik jūieler: Oqulyq. — Almaty: JŞS «Poligrafkombinat», 2013. – 656 bet.

ДИСПЕРСТИК ЖҮЙЕЛЕРДІ АЛУ ЖӘНЕ ТАЗАЛАУ ӘДІСТЕРІ

Есимбекова А.Ж.

*Оян ауылындағы МДШО бар орта мектебі, Қазақстан Республикасы,
Жетісу облысы, Қаратал ауданы
e-mail: aynur_esimbekova@mail.ru

Мақалада 10-сыныпта химияны оқытудағы заманауи коллоидтық химия дисперсті жүйелер мен беттік құбылыстар туралы ғылым болып табылады. Химияны оқыту процесінде дисперсті жүйенің ең маңызды сипаттамаларына назар аудару керек, бұл процестердің гетерогенділігі мен дисперсиясының негізі болып табылады. Оқушылар гетерогенділік пен екі немесе одан да көп фазалардың болуы көлеммен салыстырғанда артық энергиялы фазалардың интерфейсінің болуын және нәтижесінде бетіндегі ерекше қасиеттер мен құбылыстарды анықтайтынын білуі керек. Беттің ауданын дисперсті фазаның бөліну өлшемі және жүйенің жалпы қасиеттеріндегі беттік қасиеттердің үлесі ретінде анықтайды.

Кілт сөздер: *коллоидтық химия, дисперсті жүйе, дисперстік фаза, куанифоль, молекула, эмульсия.*

МЕТОДЫ ПОЛУЧЕНИЯ И ОЧИСТКИ ДИСПЕРСНЫХ СИСТЕМ

Есимбекова А.Ж.

*Средняя школа с МДШО с. Оян, Каратальский район, Жетысуская область, Республика
Казахстан
e-mail: aynur_esimbekova@mail.ru

В статье при преподавании химии в 10 классе рассматривается, что современная коллоидная химия - это наука о дисперсных системах и поверхностных явлениях. В процессе преподавания химии необходимо обратить внимание на наиболее важные характеристики дисперсной системы являющиеся основностью неоднородности и дисперсности проходящихся процессов. Учащиеся должны усвоить, что неоднородность и наличие двух или более фаз, определяет наличие границы раздела фаз с избыточной энергией по сравнению с объемом и, как следствие, специфические свойства и явления на поверхности. Определяет площадь поверхности как меру разделения дисперсной фазы и долю свойств поверхности в общих свойствах системы.

Ключевые слова: *коллоидная химия, дисперсная система, дисперсная фаза, канифоль, молекула, эмульсия.*