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IN ATMOSPHERIC COLLOID DISPERSE ENVIRONMENT THE DISCOVERY OF COAGULATION

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Abstract

In the present paper in the atmospheric coagulation has been revealed. The physico-chemical analysis of the atmospheric aerosol formation by analytical means and using a phase diagram is presented. The bordershe of the atmospheric colloid-disperse medium are put forward. Atmospheric coagulation is determined by kinetic and potential energies of the constituent molecules and ions, which are characterized the degrees of freedom of ion movement and parameters of changing in the position of ions with different isotopes. As a result of coagulation, the energy balance of the atmospheric membrane was presendet by the energy of the phase transition and by the work done. In the frames of revealing the atmospheric coagulation, the problem of climate mitigation is solved.

Keywords: atmospheric coagulation, aerosol, non-dense solution, saturated gas, dispersion, condensation.

Introduction

The composition of the industrial aerosol was known as coarse-grained particles of crystals, liquids and gases of industrial origin [1], which in the form of atmospheric emissions make up a certain part of the atmospheric aerosol.

An example of a mathematical algorithm for the movement of particles dispersed in the atmosphere was known [2].

Studies of the dynamics of solubility of heavy gases were known [3], which consider the thermodynamic parameters of the system: average energy, free energy and heat capacity.

Before the studies carried out by me the atmospheric coagulation had not been revealed. I discovered it by the solubility in water of gaseous mixtures and of industrial origin crystals in the atmosphere in the form of hydration, dissociation and other physicochemical reactions. As a result, the composition of the atmospheric aerosol and the limits of the components of the atmospheric colloidal dispersion medium were proposed.

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Conflict Setting

The goal of the work is to reveal the atmospheric coagulation. I discovered it by the solubility of atmospheric gas mixtures, crystals of volcanic and industrial origin in water.

As a result of revealing the coagulation, was presented the composition of the atmospheric aerosol, the limits of atmospheric colloid-disperse medium were proposed with ice, solid liquid mass, saturated steam, gaseous, aqueous components.

As a result of the physicochemical analysis of the atmospheric aerosol composition, technologies for preventing fogging, fog dispersion and fog condensation will be proposed.

Research Results

The atmospheric colloid-disperse medium is a system of gaseous mixtures, of water vapor, small crystals of volcanic and industrial origin [4] and bacterias [5]. The gas mixture mainly contains nitrogen (78%) and oxygen (21%), and the remaining 1% contains water vapor, carbon dioxide, argon, neon, helium, methane, hydrogen and other components.

Biologically active bonds are formed as a result of the interaction of stable particles: such as of the isotopes oxygen ^{16}O , ^{17}O, ^{18}O, as well as molecular altotropic modifications of O_2, O_3, of the hydrogen isotopes ^{1}H, ^{2}H, of the nitrogen isotopes ^{14}N, ^{15}N and of the carbon isotopes ^{12}C, ^{13}C which are present in the atmosphere. The content of heavy hydrogen ^{2}H in the atmosphere is small.

The atmospheric colloid-disperse medium is constantly changing in the process of coagulation exchange of atmospheric components, forming atmospheric aerosol.

Atmospheric coagulation has been revealed based on the solubility of gaseous mixtures of the atmosphere and crystals of volcanic and industrial origin in water. The molecules of the solute have a selective permeability, due to which the water molecules, which are polar solvents, pass into the solute. Conditioned by the permeability of water particles in the atmospheric components, the substance hydration dissociation and other physicochemical reactions occur.

In the process of atmospheric coagulation exchange, molecules of ammonia (NH_3), nitrogen dioxide (NO_2), nitric acid (HNO_3), methane (CH_4), carbon dioxide (CO_2) and ammonium ion (NH4+) are formed, which by dispersion and condensation with crystals of volcanic and industrial origin [6], water vapor form an atmospheric aerosol.

Atmospheric aerosol is the result of the dissolution process of components proceeding at the molecular, ionic level. Due to the solubility of atmospheric gases in water, aqueous solutions are formed, which at certain pressures and temperatures [7,8] turn into saturated steam or ice crystals, forming a dense and humid environment in the atmosphere. The gas mixture $N_2+O_2+CO_2$ is dissolved in water, releasing heat. Crystals of volcanic origin and industrial wastes as dispersed phases, with partial or complete solubility in aqueous solutions, form an atmospheric aerosol.

Using the phase diagram P=f(t) in limits of the aggregate states of solid-liquid-gas, a physicochemical analysis of atmospheric aerosol using a liquefaction-evaporation line, a liquefaction-crystallization line, and a sublimation line has been revealed.

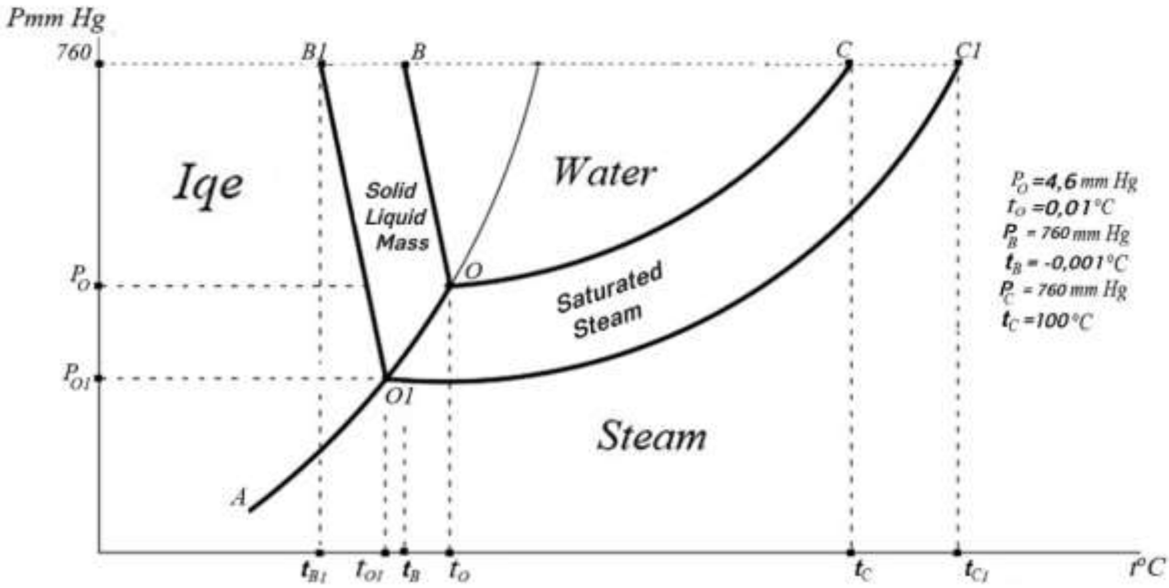

Fig. 1 The phase diagram of atmospheric aerosol at low pressures.

BOCA is the well-known phase diagram of water according to the Clapeyron-Clausius equation. $B_1O_1C_1A_1$ is the diagram of an atmospheric dilute solution.

In the water phase diagram we know, OC, OB, and OA are the water liquefaction-evaporation, liquefaction-crystallization and the sublimation lines. At all points of the OC, OB, and OA lines, the system is two-phase. At point 0, the three phases of water (solid-liquid-vapor) are balanced simultaneously, and the number of degrees of freedom is zero. At point 0, it is impossible to change any parameter from which the equilibrium of the system would not be disturbed.

O_1C_1, O_1B_1, O_1A_1 are the lines of liquefaction-evaporation, liquefaction-crystallization, sublimation of dilute solutions.

Aqueous solutions of atmospheric gases are dilute. Their properties do not depend on the composition of the solute, but depend on the number of particles of the solute. The mutual influence of particles of dilute solutions can be excluded, and the properties of the solvent will be preserved. When the temperature of the solution changes, only the solvent-water evaporates or crystallizes. These solutions are characterized by the pressure decrease of saturated vapors, increase of the boiling temperature, decrease of the hardening temperature, depending on the density of the substance dissolved in the solution [9].

The phase transitions of sublimation and evaporation of water and dilute aqueous solutions are proposed according to the Clapeyron-Clausius equation

$$\frac{dP}{dT} = \frac{L}{T \cdot (V_1 - V_2)},$$

where L- is the latent heat of the phase transition expressed in J; V_2, V_1 - are the volumes of liquid, gas expressed in m^3; T- is the temperature of the phase transition expressed in ^oC.

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The density of water in the aggregate states of solid-liquid-gas ranges from 0.958÷ 1 g/m^3. The highest density is at 4 °C: p = 1 g / ml. When water turns into ice, as an exception, the density decreases slightly, and the volume change is also small. The liquid-solid phase transition line of water is presented through the direct dependence on the pressure temperature, through the straight line $\frac{P}{T} = const,\ V = const.$

As a result of analysis of the phase diagram P=f(t) of atmospheric aerosol formation, it was revealed the boundary of the saturated and supersaturated steam CC_1O_1O, the boundary of the solid liquid mass BB_1O_1O with a cooled liquid, molten crystals generated in the coagulation process.

According to the novelty, the steams, waters, solids, saturated steams, solid liquid mass of the atmospheric colloidal dispersion medium were proposed in the P=f(t) phase diagram. From the diagram, the transition from one limits to another is evident of the at different pressures and temperaturesone.

The O_1 O line in the diagram represents the transition line from the saturated steam boundary to the solid-liquid boundary or the transition line from the solid-liquid boundary to the saturated steam boundary under conditions of temperature $t_{01} \le t \le t_0$, pressure $P_{01} \le P \le P_0$. O_1A_1 is a sublimation line at pressure $P \le P_{01}$ and temperature $t < t_{01}$, within the limits of which it is possible that the supersaturated, cooled steam would not rise above the dew point to prevent fogging.

In the process of atmospheric coagulation, the Vander-Waals forces of interaction between molecules and ionization of molecules [10,11] act depending on the distance. The resulting potential energy of ion interaction according to Coulomb's law $E_{P_i} = \frac{q_1 * q_2}{4\pi * \varepsilon_0 * r}$, is a characteristic of atmospheric coagulation.

The potential energy of the interaction of ions is presented taking into account the masses of isotopes [8] by the following formula:

$$E_{P_i} = \frac{m_i}{m} * \frac{q_1 * q_2}{4\pi * \varepsilon_0 * r}, \qquad Ep = \sum_{i=1}^{n} \frac{m_i}{m} * \frac{q_1 * q_2}{4\pi * \varepsilon_0 * r}, \qquad (1)$$

where m - is the mass of an ion without heavy isotopes expressed, in units mg; m_i - the mass of an ion with heavy isotopes expressed, in units mg; q_1, q_2 - the charges of ions, in units Coulomb; r - is the distance between the ions, in units *nm*;ε_0 -is the electric constant in vacuum: 8.85*10^{-12} F/m; n -is the number of ions transferred; Ep -is the potential energy of the ion interaction, in units *J*.

The kinetic energy of the motion of molecules and ions during coagulation is presented by the number *n* of freedom degrees for the particle motion by the following analytical expression:

$$E_{k_i} = \frac{m_l \cdot v_i^2}{2}, \quad E_k = \sum_{i=1}^{n} \frac{mi \cdot Vi^2}{2},$$

$$l_i = f(l_{i1}, l_{i2}, l_{i3}, \cdots l_{ik}), \quad l_{i1} = f_1(t), \ldots\ l_{ik} = f_k(t)$$

$$v_i = \frac{\Delta li}{\Delta t} = l_i'(t), \quad v_i = l_i'(l_{i1}) \cdot l_{i1}'(t) + l_i'(l_{i2}) \cdot l_{i2}'(t) + \cdots l_i'(l_{ik}) \cdot l_{ik}'(t), \qquad (2)$$

where l_i is the displacement of the i th ion, in units *mm*; v_i is the velocity of the ion movement, in units *mm/sec*; k is the number of degrees of freedom determining the movement of ions; n is the number of the moving ions; m_l is the mass of the ion, in units *mg*; t is the ion transfer period, in units *sec.*; E_k is the kinetic energy of the ion, in units of J.

As a result of atmospheric coagulation, at some point, the energy balance of the atmospheric membrane moves to another level, sometimes changing the aggregate states of the constituent substances or releasing new compounds.

In accordance with the law of energy conservation, it is presented as follows:

$$E \sim E_f - A, \qquad E_f = E_p + E_k \tag{3}$$

where E -is the energy of the system as a result of coagulation, in units of J; E_f is the energy of the phase transition expressed in terms of the kinetic and potential energy of the component exchange, in units of J; A is the work performed during the coagulation, in units of J.

Conclusion

A colloid-disperse medium is formed in the process of coagulation exchange, by condensation and dispersion, by distributing particles of one or more substances in another substance.

In a gaseous colloid-disperse medium, coarse-grained particles of small crystals, liquid crystals, saturated vapor range in size from 10^{-1} nm to 10^5 nm are found, which are aerosols.

Atmospheric aerosol is formed in atmospheric colloid-disperse medium in the coagulation exchange process of active, potentially sensitive components in the form of hydration, dissociation and other physicochemical reactions, which, at some point, brings the energy uniformity of the atmospheric membrane to a new level.

In the work, the atmospheric coagulation has been revealed, the composition of atmospheric aerosol is presented, and boundares for the atmospheric colloid-disperse medium are proposed.

As a result of the physicochemical analysis of the atmospheric aerosol composition, technologies for preventing fogging, fog dispersion, fog condensation will be proposed.

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ՄԹՆՈԼՈՐՏԱՅԻՆ ԿՈԼՈԻԴԱԴԻՍՊԵՐՍ ՄԻՋԱՎԱՅՐՈՒՄ ԿՈԱԳՈՒԼՅԱՑԻԱՅԻ ԲԱՑԱՀԱՅՏՈՒՄԸ

Ա.Մ. Գրիգորյան
Մ.Մաշտոցի անվան համալսարան

Աշխատանքում վերլուծվել է մթնոլորտային կոագուլյացիայի երևույթը: Ներկայացվել է մթնոլորտային աերոզոլի ձևավորման ֆիզիկաքիմիական անալիտիկան՝ վերլուծական միջոցներով, ֆազային դիագրամի միջոցով: Առաջադրվել են մթնոլորտային կոլոիդադիսպերս միջավայրի եզրույթները:

Մթնոլորտային կոագուլյացիան բնորոշվել է բաղկացուցիչների մոլեկուլների, իոնների թափանցելիության կինետիկ և պոտենցիալ էներգիաների միջոցով՝ իոնների շարժման ազատության աստիճանների, տարբեր իզոտոպներով իոնների դիրքի փոփոխության պարամետրերով:

Կոագուլյացիայի արդյունքում մթնոլորտային թաղանթի էներգահավասարակշռությունը ներկայացվել է ֆազային անցման էներգիայի, կատարված աշխատանքի միջոցով:

Մթնոլորտային կոագուլյացիայի բացահայտման շրջանակներում առաջարկվում է լուծել կլիմայի մեղմացման խնդիրը:

Բանալի բառեր. մթնոլորտային կոագուլյացիա, աերոզոլ, նոսր լուծույթ, հագեցած գազ, դիսպերսիա, կոնդենսացիա:

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ИССЛЕДОВАНИЕ ПРОЦЕССА КОАГУЛЯЦИИ В КОЛЛОИДНО-ДИСПЕРСНОЙ АТМОСФЕРНОЙ СРЕДЕ

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В работе исследовано явление атмосферной коагуляции. Представлено физико-химический анализ образования аэрозоля в коллоидно-дисперсной атмосферной среде с помощью аналитического выражения и фазовой диаграммы. Предложены пределы атмосферной коллоидно-дисперсной среды.

Атмосферную коагуляцию определено посредством кинетической и потенциальной энергии проницаемости составляющих элементарных частиц, характеризуемой степенями свободы движения, изменениями положений изотопов атомов.

Энергетический баланс атмосферного слоя, образовавшегося в результате коагуляции, представлено в рамках пассивных и активных обменов, с помощью кинетической и потенциальной энергий, работы, совершенной для проницаемости составляющих частиц.

В рамках открытия коагуляции атмосферы предлагается решить проблему смягчения климата.

Ключевые слова: атмосферная коагуляция, аэрозоль, разбавленный раствор, насыщенный газ, дисперсия, конденсация.

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