

DERYAGIN, B.V.

USSR/ Chemistry - Conferences

Card 1/1 Pub. 124 - 14/45

Authors : Deryagin, B. V. Memb. Corresp. of Acad. of Sc. USSR

Title : Study of coagulation and flocculation phenomena

Periodical : Vest. AN SSSR 2, 66-70, Feb. 1955

Abstract : An account is given of meetings held at the Sheffield University, England (September 15-17, 1954), where debates were conducted on problems concerning the study of coagulation and flocculation phenomena in chemistry. The conference was called by the International Faraday Society and the resolutions adopted at the meeting are stated.

Institution :

Submitted :

DERYAGIN, B.V.; VLASENKO, G.Ya., kandidat khimicheskikh nauk

Determining the degree of dust pollution of air by continuous
microscopy. Bor'ba s sil. 2:223-229 '55. (MLRA 9:5)

1. Chlen-korrespondent Akademii nauk SSSR (for Deryagin) 2.
Institut fizicheskoy khimii Akademii nauk SSSR (for Vlasenko)
(DUST)

Derjagin, B.V.

519.61 62
 7446. Problems of adhesion. B. V. DERJAGIN.
Research, 8, No. 2, 70-4 (Feb., 1955).
 A condensed translation of a Russian paper [*Vestnik Akad. Nauk SSSR, 7, 30 (1954)*] describing the work done in that country and a review of the current views on the subject. The commonly accepted idea of the relation of surface tension to adhesion behaviour is stated to be not quite right. One observation proving this, being the variation of specific adhesion with velocity of separation which could not be explained on the surface tension theory. The type and number of chemical bonds per unit area is however important, an example being the role of sulphur in the vulcanizing process. The electrical double layer at the boundary is thought to be especially important, and very extensive experimental work has been carried out on electron emission when an adhesive film is removed quickly from a metal or dielectric surface so that separation occurs at the boundary. The results explain the variation of adhesion with gas pressure (on the basis of discharge in gases). When separation takes place over the whole contact area simultaneously the important mechanism becomes a molecular one, separation depending upon stress at the interface. Factors especially in need of further research are indicated. T. C. BAXA

DERYAGIN, B. V.

USSR/Chemical Technology - Chemical Products and Their Application. Photographic Materials, I-19

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 63023

Author: Deryagin, B. V., Levi, S. M.

Institution: None

Title: Problems of Rheology in Production of Light-Sensitive Materials

Original

Periodical: Izv. AN SSSR, Otd. Tekhn. n., 1955, No 9, 43-52

Abstract: Presented is the derivation of a theoretical equation of the deposition of a layer of plastic-viscous liquid on a flexible support. The equation determines the correlation between properties of the liquid (viscosity (η), limiting shear stress (θ), surface tension (σ), density (ρ), rate of travel of support (U) and angle of egress (α) of support from liquid) and amount of liquid (h) carried off by the support. In the case of deposition of a photographic emulsion on a celluloid base the equation is of the form:

Card 1/3

USSR/Chemical Technology - Chemical Products and Their Application. Photographic Materials, I-19

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 63023

Abstract:
$$h_0 = \frac{0.94 (U\eta)^{2/3}}{(1 + \cos \alpha)^{1/2} (\rho g)^{1/2} \sigma^{1/6}} \times \left[1 - \frac{(0.93)^3}{3} \operatorname{ctg} \frac{\alpha}{2} \left(\frac{U}{\sigma} \right)^{1/3} \right] + \frac{4.58 \theta^2}{(1 + \cos \alpha)^{3/2} (\rho g)^{3/2} \sigma^{1/2}}$$

Presented are the results of experimental verification of the equation, on casting of the photographic emulsion, which show that by means of this equation it is possible to calculate with sufficient accuracy the thickness of the deposited emulsion layer. For measurement of η and θ use was made of a capillary viscosimeter by means of which determination was made of the time of outflow of the liquid at different excess of pressure, and η and θ were calculated according to the equation of Shvedov integrated for the instance of liquid outflow through a capillary. It is shown that this equation is applicable to photographic emulsions of different concentration of gelatin. Determined were the effects of temperature and concentration of the solutions, and also of surface active agents, on η and θ . There is proposed and substantiated a formula of change in specific viscosity of gelatin solution due to the action of the above-stated factors.

Card 2/3

USSR/Chemical Technology - Chemical Products and Their Application. Photographic
Materials, I-19

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 63023

Abstract: It has been ascertained that under the action of non-diffusing components of color development, which are surface active substances, on change in the viscosity by 10^3 times the coefficient an asymmetry of gelatin molecule, calculated according to the viscosity equation of Einstein and Simch, increases from 19 to 38. With the above stated increase of η the magnitude of θ changes very slightly.

Card 3/3

DERYAGIN, B.V. (g.Moskva)

Electrical theory of film adhesion. Fiz.v shkole 15 no.1:
19-23 Ja-F'55. (MLRA 8:2)

1. Chlen-korrespondent Akademii nauk SSSR.
(Adhesion)

DERYAGIN, B.V.

Discussion on coagulation and flocculation organized by the Faraday
Society at Sheffield, Sept. 15-17, 1954. Koll.zhur. 17 no.2:149-157
Mr-Ap '55. (MLRA 8:5)
(Sheffield, England--Colloids--Congresses)

DERYAGIN, B.V.

3

The concept and determination of the magnitude of the wedge effect and its importance for the statics and kinetics of thin liquid layers. B. V. Deryagin (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *Kolloid. Zhur.* 17, 217-14 (1955). Equations are given for the effect of the mutual repulsion of electric layers on the thickness of liquid films between two solids or a solid and a gas phase. The flow of films of nonuniform thickness is affected by the "wedge effect" (cf. D. and S. V. Ierpin, *Doklady Akad. Nauk. S.S.S.R.* 100, 17(1955)). Also in *Colloid J. U.S.S.R.* 17, 111-7(1955) (Engl. translation).

BP
3/21

DERVAGIN, B. V.

L

~~A New Method of Determining the Grain-Size and Specific Surface of Powders as Used in Powder Metallurgy. B. V. Dervagin, N. N. Zakhayeva, and M. V. Talaev (Zhur. Prikl. Fiz., 1966, 25, (5), 861-888). [In Russian]. The method and apparatus are similar to those developed by D. for appn. to phys. chemistry. Air at low pressure is filtered through the powder, and the resistance to its flow is measured. Obviously, the finer the powder, the greater the resistance. Provided that the pressure of air is low enough for interactions~~

between air mol. to be \ll interactions between air mol. and powder particles (i.e. the molecular mean free path \gg particle spacing), it is possible to calculate accurately the sp. surface area of the powder. Full aerodynamic theory and description of D.'s apparatus are given. As a test, results on powders of Cu (8-10 μ), Fe (7-12 μ), and Al (60-600 μ) are compared with microscopic measurements. Good agreement is obtained for Cu and Fe. Agreement for the Al powders is bad, as they were in the form of spiral-shaped shavings; the microscope measured the overall dimensions, while the physico-chem. method took account of the spaces in the middle of the spirals.—A. F. B.

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DEKVALGIN

BY

200

MT ✓ The theory of enameling and its practical application (the thickness of the layer of liquid, which remains after the run-off from vertical walls, or which is entrained by a moving wall). B. V. Dekvagin and S. M. Levi. *Zhur. Tekh. Fiz.* 24, 1914 (1955). The formulas are derived for the thickness of the enamel layer as a function of the viscosity, the rate of application, surface tension, intermetal tension, and temp. The formulas are tested by the use of mineral oil and dibutyl phthalate; the error never exceeded ±5%.

200

MT

①

DERYAGIN, B. V.

✓ The specific-surface determination of dispersed bodies by
 the air-permeability method. *B. V. Deryagin, N. S. Zakhvatyn, E. E. Zuzman, I. V. Pilyav, and M. M. Deryagin.* *Dokl. Akad. Nauk SSSR* 1957, 131, 1024-1026.

Abstract: The Deryagin method for detg. the specific surface (Sp) of
 2000-43, 187) was found to be a universal method suitable
 for detg. the sp. surface of coarse and fine detg. signs, also
 based on the filtration of a sample method the through
 the pores of a porous material. The surface values of dispersed bodies
 if the pores are closed, represent directly the surface of the
 face, which partakes in the random process of detg. signs,
 streams, sedms., etc. Sp-surface detms. of similar particles
 detd. by various methods are compared in a table.

W. D. Sternberg

LTH

DERYAGIN, B. V.

Category : USSR/Atomic and Molecular Physics - Gases

D-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 926

Author : Deryagin, B.V., Zorin, Z.M.

Title : Investigation of Surface Condensation and Adsorption of Vapors Near Saturation
Using the Optical Micropolarization Method. I.

Orig Pub : Zh. fiz. khimii, 1955, 29, No 6, 1010-1019

Abstract : Description of a new method for investigating the adsorption on an optically polished surface of glass, based on measuring the changes in the parameters of the elliptic polarization of light reflected at an oblique angle. The glass surface was cleaned by glow discharge prior to the experiment.

Card : 1/1

DERYAGIN, B.V.

USSR/ Chemistry - Physical chemistry

~~Card 1/2~~ Pub. 147 - 3/21

Authors : Deryagin, B. V., and Zorin, Z. M.

Title : Study of surface condensation and adsorption of vapors close to saturation point by means of an optical micropolarization method. Part 2

Periodical : Zhur. fiz. khim. 29/10, 1755-1770, Oct 1955

Abstract : An optical measurement of vapor adsorption on a smooth glass surface showed that the steep rise in the isothermal adsorption curve begins at certain relative pressures. The thickness of the adsorption vapor layer of polar substances was found to be approximately exponentially dependent upon the vapor pressure. The adsorption isotherm for nonpolar substances showed a steep rise at relative pressures of about 0.98 and approached the saturation ordinate asymptotically. It is shown that the adsorption vapor layer

~~of nonpolar substances~~ : of nonpolar substances cannot be considered as a separate phase differing from volumetric and the reasons for it are explained. Twelve references:

Submitted : 8 USSR, 1 Eng., 2 USA and 1 French (1927-1955). Graphs; illustrations.

Acad Sci USSR, Inst. Phys Chem., Moscow

DERYAGIN, B. V.

USSR/Physics - Hydromechanics

Card 1/1 Pub. 22 - 4/50

Authors : Nerpin, S. V., and Deryagin, B. V., Member-corresp. of the Acad. of Scs. of the USSR

Title : The kinetics of flow and stability of thin layers of liquid along a solid base taking into account a solvate film (of the liquid) as a special phase

Periodical : DOK. AN SSSR 100/1, 17-20, Jan. 1, 1955

Abstract : A mathematical analysis of flow and stability of thin layers of a liquid along a solid base is presented. The analysis is made from the point of view of the consideration of thin layers of a liquid as films of the latter is a special phase (a part of this liquid that lost its fluidity). Such a concept makes the analysis easier. Results of the analysis can be applied to the solutions of such problems as "the movement of moisture in the ground," etc. Six references; USSR (1937-1945). Graphs.

Institution: Acad. of Scs. of the USSR, Institute of Physical Chemistry and the Leningrad Institute of Water Transportation Engineers

Submitted :

DERYAGIN, B.V.

USSR/Chemistry - Physical Chemistry

Card ~~378~~ Pub. 22 - 25/51

Authors : Deryagin, B. V., Memb. Corresp. of Acad. of Sc. USSR., and Karasev, V. V.

Title : ~~Boundary viscosity of organic substances studied by the kinetics of the~~
thinning wetting layers during the blow-off process

Periodical : Dok. AN SSSR 101/2, 289-292, Mar 11, 1955

Abstract : A change is described in the method of blow-off which was found suitable for less stable layers during the blow off of a specific part of the wetting layer. The "blow-off" method introduced for measuring the viscosity of liquid layers bordering with the surface of a solid body is based on the determination of the approximate wetting boundary of the layer obtained sometimes after its blow-off.

Institution : Results show that a solid body is capable of causing a change in the viscosity of the adjoining liquid layers because of the change in the orientation of the solvent molecules. Nine references: 7 USSR and 2 English (1934-1954). Graphs; drawing.

Submitted

Inst. Phys. Chem, Acad Sci USSR

Derjagin, B.V.

3

1957

1957. Role of mechanical and molecular roughness in external friction. D. V. Derjagin and S. B. Hartsman. *Dokl. Akad. Nauk SSSR* 193, 1931-3; *Compt. Rend. Acad. Sci. Paris* 245, 1957, 193. The formula $F = \mu N$ (where N is the normal pressure, μ the friction factor, and $\mu = \tan \delta$, δ being the angle of the slope of the boundary molecules of a body in slip against the molecules of another body, derived from the molecular theory of friction, is extended to some special cases, including the friction of rubber on a solid.

1957

Yakovlev, D. V.

502

The use of crossed filaments in the study of solvation of
 polymer surfaces, their cohesion in liquid media, and the
 modelling of colloidal processes. N. I. Moskovitin, M.
 E. Rutan, and B. V. Deryagin. Doklady Akad. Nauk
 S.S.S.R. 105, 768 (1965). (C.A. 29, 1306) was used in the study of polymers by coat-
 ing quartz filaments with thin and smooth polymer films.
 The film thickness was more than 1 μ , i.e. much larger than
 the mol. attraction radius, and the adhesion was unaffected
 by quartz, but only by the film material. A method of pro-
 ducing films of uniform thickness is described. The solva-
 tion of hydrated cellulose, ethylcellulose, acetylcellulose,
 nitrocellulose, and benzylcellulose was studied. The results
 indicate the method to be suitable for modelling the inter-
 action between the colloidal or dispersed particles and a
 variety of media.
 W. M. Sternberg

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INVENTORY, B-11

Supersaturation and condensation between moist surfaces maintained at unequal temperatures. S. S. Dukhin, E. V. Deryagin, and M. L. Mikhe'ison (Sci. Research Station in Krivoi Rog). *Doklady Akad. Nauk S.S.S.R.*

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28

105, 1229-32(1955).—Conditions of stable space supersatn. with water vapors (similar to conditions in a Wilson cloud chamber) were studied between moist surfaces at const. and unequal temps. The supersatn. can be varied within wide limits by changing the temps. of the surfaces. The supersatn. and condensation can be the basis of the construction of highly effective condensation filters for air purification by elimination of submicroscopic particles; such *air filters* were developed to prevent silicosis. Dust elimination attained 96-99.99%. Each dust particle is increased in wt. thousands of times in condensation filters developed in Krivoi Rog. With the surfaces spaced 5 cm. apart, a channel 200 cm. long and a velocity of 5 m./sec., the temps. of the cold and the warm surfaces at 15 and 50°, resp., a fog with droplets of 5 μ was obtained. Small and medium-size condensation filters for 1, 2, and more cu.m./min. throughout were constructed. Filters of this type are very economical and efficient in places that have large amts. of warm waste water.

W. M. Sternberg

PM

DERYAGIN, Boris Vladimirovich; KIPNIS, S.Ye., redaktor; FURMAN, G.V.,
tekhnicheskiy redaktor

[The nature of molecular forces and their significance in science
and practice] Priroda molekuliarnykh sil i ikh znachenie v nauke i
parktike. Moskva, Izd-vo "Znanie," 1956. 39 p. (Vsesoiuznoe obshche-
stvo po rasprostraneniuiu politicheskikh i nauchnykh snanii. Ser. 3,
no.35) (MLRA 9:10)

1. Chlen-korrespondent Akademii nauk SSSR (for Deryagin)
(Molecules)

DERYAGIN, B. V. *Gen. Inzh. AS USSR*

"Present Status of the Theory of the Stability of Lyophobic Suspensions and Sols" (Sovremennoye sostoyaniye teorii ustoychivosti liofobnykh suspenziy i zoley) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp.225-249, Iz. AN SSR, Moscow, 1956

(Report given at above Conference, Minsk, 21-4 Dec 53)

Author: Institute of Physical Chemistry AS USSR,
Laboratory of Surface Phenomena (Lab. poverkhnostnykh yavleniy)

DERYAGIN, B. V.; MOSKVITIN, N. I.; FUTRAN, M. F.

"Study of the Adhesion of Surfaces in Liquid Media by the Method of Interlacing Threads with a view to the Modeling of the Interaction of the Colloid Particles and the Character of their Surface Solvation (Izucheniye slipaniya poverkhnostey b zhidkikh sredakh metodom skreshchennykh nitey s tsel'yu modelirovaniya bzaimodeystviya kolloidnykh chastits i kharakteristiki ikh poverkhnostnoy sol'vatatsii) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 285-300, Iz AN SSSR, Moscow, 1956

(Report given at above Conference, Minsk, 21-4 Dec 53)

Deryagin: Corr. Mbr. AS USSR

DERYAGIN, B. V.

Category: USSR

B-13

Abs Jour: RZh--Kh, No 3, 1957, 7705

Author : Deryagin, B. V., Karasev, V. V., and Sorin, Z. M.

Inst :

Title : Interfaces as Special States of Aggregation of Liquids

Orig Pub: Sb. Posvyashch. Pamyati Akad. P. P. Lazarev, Moscow, Academy of Sciences USSR, 1956, 65-83

Abstract: See RZhKhim, 1954, 30393, 1955, 13704.

Card : 1/1

-9-

DERYAGIN, B. V. and ABRIKOSOVA, I. I.

"Direct measurements of the molecular attraction between solid bodies in a vacuum." Soviet Phys. "Doklady" 1, 280-4, 1956.

DERYAGIN, B.V.; VOLAROVICH, M.P.

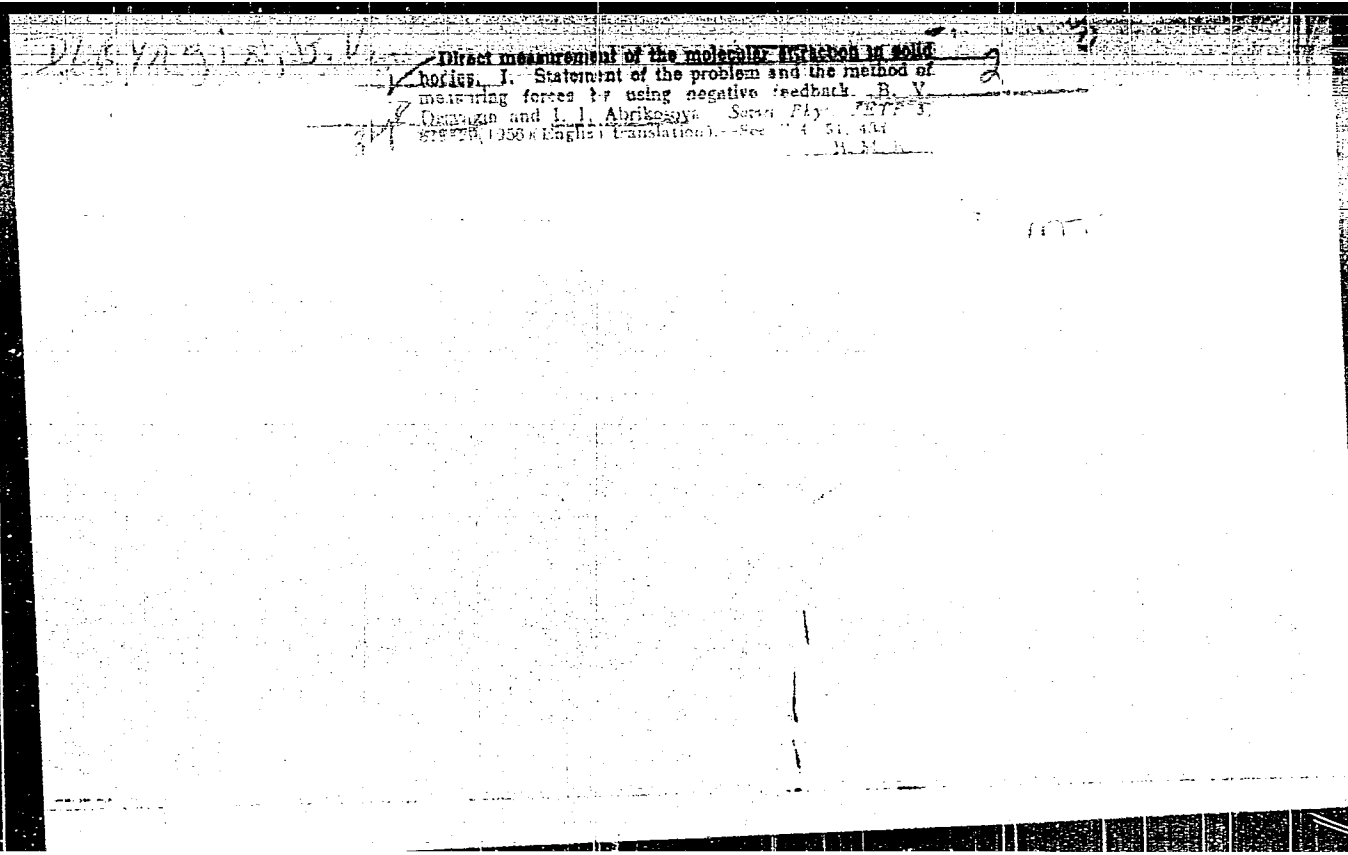
Petr Petrovich Lazarev, founder of Russian biophysics. *Biophysika*
1 no.3:193-200 '56. (MIRA 9:9)

(LAZAREV, PETR PETROVICH, 1878-1942)
(BIOPHYSICS)

DERYAGIN, B.V.; LEVI, S.M.

Kinetic wetting in coating and a method of measuring it. Zhur.
nauch.i prikl.fot.i kn. 1 no.5:354-358 S-0 '56. (MLRA 9:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy kino-fotoinstitut.
(Photographic emulsions)



USSR/Chemistry of High Molecular Substances.

F

Abs Jour : Referat. Zhurnal Khimiya, No 6, 1957, 19423.

Author : E.V. Deryagin, S.K. Zherebkov, A.M. Medvedeva.

Inst :

Title : Concerning the Part of Diffusion of Polymer Chains in the Mechanism of Adhesion and Autohesion (Sticking Together) of Rubbers.

Orig Pub : Kolloid. Zh., 1956, 18, No 4, 404-412.

Abstract : With a view to study the influence of relaxation or diffusion processes on autohesion, the autohesion of HK and SKB was investigated, using the method of crossed quartz threads covered with rubber films (Kolloid. zh., 1950, 12, 431; RZhKhim, 1956, 32140). It was shown that the energy of autohesion sharply increased in case of films from 0 to 0.1 μ m and above 0.5 μ m thick, which was connected with the increase of van der Waal's forces in the first case, and with the facilitation of formation of platforms at easily de-

Card 1/3

-12-

USSR/Chemistry of High Molecular Substances.

F

Abs Jour : Referat. Zhurnal Khimiya, No 6, 1957, 19423.

formed thick films in the second case. In the thickness interval from 0.1 to 0.5 μ , the autohesion energy did not depend on the film thickness. The increase of the contact duration increased the autohesion energy only if the film thickness was >0.5 μ , from which it followed that the diffusion processes did not play any part in the autohesion of thin films. During the study of the correlation of the combinability of various rubbers and their adhesion one to another and autohesion, the measurement of the shearing strength of rubber adhesion was carried out and it was shown that in case of butyl rubber, the diffusion processes did not play a great part and that its adhesion strength was determined by the area of the true contact depending on the mechanical properties and by the influence of forces connected with the double electrical layer, which played an essential part at the measurement of the work of tearing by the method of exfoliation. In case of NK, SKS-30, SKS-26,

USSR/Chemistry of High Molecular Substances.

F

Abs Jour : Referat. Zhurnal Khimiya No 6, 1957, 19423.

SKB and nairite, the diffusion processes play an important part, which is confirmed by the correspondence of the adhesion magnitude to the combinability of rubbers, and it is most reliable to characterize the superficial combinability of rubbers by the similitude of their polarity. At this occasion, $T_{12} / T_{11} > 1$ in case of the same polarity, and $T_{12} / T_{11} < 1$ in case of different polarity, where T_{11} and T_{12} are the measured shearing resistance of identical and different rubbers respectively.

Card 3/3

-14-

DERJAGIN, B.V.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1260
AUTHOR DERJAGIN, B.V., PROCHOROV, P.S., BATOVA, G.A., LEONOV, L.F.
TITLE The Diffusion Hygrometer.
PERIODICAL Žurn. techn. fis, 26, fasc. 4, 887-894 (1956)
Publ. 4 / 1956 reviewed 9 / 1956

The diffusion hygrometers described here are based upon the fact that in the chamber of the device containing a dry and a humid substance (and which is separated from the material to be investigated by a porous wall) under- or overpressure is produced while the diffusion current is steady. Here 4 varieties of these hygrometers are described each of which may have its own particular sphere of action. The two chamber hygrometer consists of two chambers which are separated from the surrounding atmosphere by uniform porous separating walls (of coal or mitor). Construction and mode of operation of the device are described. Using the two chamber hygrometer is complicated by the necessary determination of the apparatus constant K, the necessity of knowing atmospheric pressure, the diffusion coefficient, and air humidity.

The three chamber hygrometer: In order to make the apparatus constant of the hygrometer independent of temperature and pressure, PROCHOROV and DERJAGIN suggested a three chamber hygrometer. The first chamber is dry, the second and third are used for compensation. Construction and operation of the apparatus are discussed. By means of this hygrometer it is possible to determine humidity independent of temperature and atmospheric pressure, above all also in the case of negative temperature. Next, hygrometers with assumed

Zurn.techn.fis, 26, fasc.4, 887-894 (1956) CARD 2 / 2

PA - 1260

sensitivity and slight inertia are described. In order to reduce inertia and at the same time to increase sensitivity, the manometer travels are strengthened by negative back-coupling. The four chamber hygrometer consists of 2 parts: of a two chamber hygrometer with a dry chamber, and of a device containing a dry and a humid matter and a porous wall. Humidity was measured by determining the ratio (decrease of pressure between dry and humid chamber / decrease of pressure measured by the two chamber hygrometer with dry material). Conclusions: The above described types of diffusion hygrometers offer some advantage against devices hitherto in use for measuring air humidity; they may be constructed so as to have different degrees of sensitivity and inertia. Diffusion hygrometers have a linear scale and make it possible to measure humidity within a wide range of temperature, also below 0° C.

INSTITUTION: Institute for Physical Chemistry, Moscow.

DERYAGIN, B.V.; PUSH, V.B.; TOLSTOY, D.M.

Theory of solids sliding with intermittent stops (frictional natural
vibration of the first type) Zhur.tech.fiz.26 no.6:1329-1342 Je '56.
(MLRA 9:9)

1.Moskovskiy stankoinstrumental'nyy institut imeni I.V.Stalina i
Institut fizicheskoy khimii AN SSSR.
(Friction) (Vibration)

Deryagin, B. V.

Math 1288. Measurement of the specific surface area of carbon black by Deryagin's method. B. V. DERYAGIN, N. N. ZAKHAYANKA, and M. V. TALAEV. *Zhurn. Priklad. Khim.*, 1956, 29, 40-52; *Chem. Abstr.*

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1956, 10, 10182. The specific area S_0 of carbon black was determined by the Knudsen-flow method. The effect of compaction of the carbon-black diaphragm was determined by compaction with a heavy metal piston in a glass vessel and with a specially designed press in a metal holder. The curves S_0 vs the porosity δ in both filters were identical; S_0 rose abruptly as δ decreased to about 7; at lower values of δ , S_0 remained constant. The results agreed with those obtained by other methods. This method is recommended for its simplicity and for the determination of the strength of carbon-black particles under pressure. 421C4-R

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DERYAGIN, B.V.

CARD 1 / 2

PA - 1405

SUBJECT USSR / PHYSICS
AUTHOR DERJAGIN, B.V., ABRIKOSOVA, I.I.
TITLE Direct Measuring of the Molecular Attraction of Solids. I.
Problems and Methods connected with the Measuring of Forces in
the Case of Negative Back-Coupling.
PERIODICAL Žurn. eksp. i teor. fis, 30, fasc. 6, 993-1006 (1956)
Issued: 8 / 1956 reviewed: 10 / 1956

The aim of this work is the direct measuring of this attraction as a function of the separating space and the application of the results obtained for the purpose of checking the corresponding theories as well as to the problem of the coagulation of aerosols and colloids. Further, the problem of molecular forces with respect to macroobjects is investigated.

At first the existing theories concerning molecular forces between macro- and microobjects are discussed and criticized. The theories concerned are those developed by LONDON, CASIMIR, POLDER, DE BOER, HAMAKER, and above all by LIFSIC. According to the theory developed by LIFSIC interaction of bodies is caused by the electromagnetic field which always exists in all absorbing bodies, and this field does not even vanish at absolute zero. The latter theory is suited for any kind of body and any temperature, but more accurate computations are impossible owing to the lack of the necessary optical characteristics. Every direct measuring method is reduced to the measuring of two quantities: the force of interaction between the approximated objects and the distance between them. The objects measured were glass and quartz glass; one of the samples was

Žurn. eksp. i teor. fis, 30, fasc.6, 993-1006 (1956) CARD 2 / 2 PA - 1405

plane, the other had the shape of a spherical lens. Measuring was carried out in air and in vacuum, but measuring in a vacuum is of greater accuracy. The vacuum used corresponded to an air pressure of from $1 \cdot 10^{-1}$ mm torr to several mm torr. The scales used should have a high directing moment and should nevertheless be very sensitive. This difficulty may be overcome by a method which resembles negative back-coupling. The shifting of the scale balance from the state of equilibrium generates an electric current. The latter causes electromagnetic reaction which forces the balance scale back into the state of equilibrium. Next, the scheme and the working principle of the device, above all of the scales and of the photoelectric transmitter, are described in detail on the basis of drawings. Molecular attraction is, owing to back-coupling, automatically put equal to the moment which acts upon the frame in the magnetic field and is proportional to amperage. By measuring amperage it is possible to determine the required force of molecular attraction. There follows a discussion of the following: Regulation of distance, self-oscillations, constructional shape of the measuring device, and gauging of the scales.

INSTITUTION: Institute for Physical Chemistry of the Academy of Science in the USSR.

DERVYGIN, B. V.

7 5 3

The effect of chemical structure on adhesion. S. A. Derjagin, Yu. M. Kichlov, and B. V. Dervygin (Inst. Phys. Chem. Acad. Sci. USSR, Moscow, U.S.S.R. Dokl. Akad. Nauk, 1921-31 (1956); cf. U.S.A. 50, 14195.—A polymer film was cast on a solid and after setting was stripped off by wt. P ; at the solid/film interface was horizontal, the angle of peeling was 90° . The work of stripping ($= P/b$ if b is the width of the film) usually increased with the rate v of stripping. For cellulose nitrate (1) ribbons on glass, P/b was almost independent of v between $v = 10^{-2}$ and $v = 10^{-1}$ cm./sec., then increased from about 60 to 30,000 ergs/sq.cm. when v increased from 10^{-1} to 10^{-2} , and rose slightly when v further rose to 10 cm./sec. The increase of P/b with v was similar for ethylcellulose on glass, but the P/b for cellulose acetate and benzylcellulose, both on glass, rose less than 10 times when v increased from 10^{-2} to 10 cm./sec. At low v , elec. charges on film and glass can neutralize each other so that P/b is detd. by mol. forces and, hence, is independent of v ; and at great v , adhesion is detd. by these charges, which are const. because there is no time for mutual cancellation, so that P/b again is almost const. From P/b values, the charge q of the glass/film interface was calcd. to be about 10^4 electrostatic units/sq.cm. for gutta-percha, capron resin, benzylcellulose, and 1, and 7, 4, and 5×10^3 for ethylcellulose, cellulose acetate, and poly(vinyl chloride), resp. If the glass plate was contaminated with $\text{HO}_2\text{C}(\text{C}_6\text{H}_5)\text{CO}_2\text{H}$, stearic acid, Fe stearate, or a Si grease, P/b was greatly reduced. The P/b value for a film of 1 on solid polymers decreased from a Na butadiene rubber > poly(vinyl alc.) > poly(CF_2Cl_2) > gelatin > polyethylene.

J. J. Bikerman

DM *WJL*

DERYAGIN, B.V.

USSR/Atomic and Molecular Physics - Molecular Physics

D-2

Abs Jour : Ref Zhur - Fizika, No 4, 1957, 8957

Author : Abrikosova, I.I., Deryagin, B.V.

Title : Direct Measurement of Molecular Attraction of Solid Bodies.
II. Method for Measuring the Gap. Results of Experiments.

Orig Pub : Zh. eksperim. i teor. fiziki, 1956, 31, No 1, 3-13

Abstract : Results are presented of measurements of molecular attraction for fused quartz for distances from 0.08 to 1 micron. The data are in good agreement with calculations using the formula of the theory of E.M. Lifshitz (Ref. Zhur. Fiz. 1956, 16311), which deals with the case of separations which are much greater than the wave lengths of the fundamental ultraviolet absorption bands, which contain undetermined empirical constants. The agreement obtained substantiates both Lifshitz theory and the electromagnetic nature of the molecular forces, which was already suggested by P.N. Lebedev in 1894. It is noted that the results of measurements of Overbeck and Sparnaay exceed the theoretical value by almost a factor of 10^4 , apparently owing to the electrostatic effects which have not been eliminated.

Card : 1/1

Доклад П. В.

17

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The role of diffusion of polymer at sites in the mechanism of adhesion and absorption of rubber
Deryagina, S. K., Zaitchikov, and A. M. Melnikov
Sov. J. Chem. Phys. 33, 1899-1906 (1956); English translation
See also, 51, 1856p.

1-152

2 May

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DERYAGIN, B.V.; DUKHIN, S.S.

Motion of aerosol particles in a diffusion field. Dokl. AN SSSR 106
no.5:851-854 P '56. (MLRA 9:7)

1.Chlen-korrespondent AN SSSR (for Deryagin).2.Institut fizicheskoy
khimii Akademii nauk SSSR.
(Aerosols) (Diffusion)

DERYAGIN, B.V.

SUBJECT USSR / PHYSICS
AUTHOR DERJAGIN, B.V., ABRIKOSOVA, I.I.
TITLE Direct Measuring of the Molecular Attraction among Solids in
the Vacuum.
PERIODICAL Dokl.Akad.Nauk, 108, fasc.2, 214-217 (1956)
Issued: 7 / 1956 reviewed: 10 / 1956

CARD 1 / 2

PA - 1386

Previous measuring of molecular attraction occurring between two solid bodies (plate and spherical lens) in air as a function of the interspace H between them was made very difficult by the viscosity of the air in the space between them. The cause of this is discussed on the basis of the equation of motion of the scale balance.

In spite of these difficulties a number of measurements was successfully carried out with a sufficient degree of reproducibility. The influence exercised by cushions was successfully reduced to a minimum by the erection of a device on an amortization platform which, in turn, was placed upon a cement base. In order to attain better stabilization of the interspace H, a two-mirror system was used. For the radical simplification of measuring and increasing its accuracy, a device for the carrying out of measurements in the vacuum was constructed. At from 10^{-1} to 1-3 mm Hg it was possible to reduce the time constant to fractions of a second in spite of the fact that the damping necessary for the prevention of self-oscillations was conserved.

Measuring results are entered into a diagram (abscissa - lg H, ordinate - lg F). The reproducibility of measurings separated from one another by long periods

Dokl.Akad.Nauk, 108, fasc.2, 214-217 (1956) CARD 2 / 2

PA - 1386

(years) and carried out with different samples of quartz glass is satisfactory. By means of the theory of the molecular interaction of convex surfaces it is possible, from the measured values of $F(H)$, to compute the energy $u(H)$ of the attraction of the parallel surfaces separated by the interspace H according to the formula $u(H) = F(H)/2\pi R$. Here R denotes the radius of the spherical surface. The values of u determined in this manner are entered into a diagram as functions of H . The values of $u(H)$, which were found with the help of various considerably curved lenses, are in good agreement, which confirms the molecular nature of the effect under investigation. The values obtained for F and u are about 20 times lower than those computed with the formula of LONDON, and they also agree better with the theory developed by H.B.CASIMIR and D.POLDER (Phys. Rev. 73, 760 (1948)). However, an accurate comparison on the basis of this theory is still not possible.

E.M. LIFSIC, Dokl.Akad.Nauk, 97, 643 (1954); *ibid.* 100, 879 (1954), *Žurn.eksp. i teor.fiz*, 29, 94 (1955) developed a strict theory on the molecular interaction of macroscopic bodies. However, an exact comparison with this theory necessitates full knowledge of the optic properties of the material in its absorption domains. However, the character of the absorption of quartz permits an approximated theoretical estimation of the forces of attraction. The values of $F(H)$ and $u(H)$ computed by the LIFSIC method agree sufficiently well with measuring results.

INSTITUTION: Institute for Physical Chemistry of the Academy of Science in the USSR.

DERYAGIN, B.V.

SUBJECT USSR / PHYSICS CARD 1 / 2 FA - 1433
AUTHOR DERJAGIN, B.V., KROTOVA, N.A., KARASEV, V.V.
TITLE The Influence exercised by Electric Phenomena on the Mechanism of
the Destruction of Some Solids.
PERIODICAL Dokl. Akad. Nauk, 109, fasc. 4, 728-730 (1956)
Issued: 10 / 1956 reviewed: 10 / 1956

At first some previous works bearing on this subject are discussed. The authors concentrate their attention on the occasion of these experiments on the destruction of mica and on the determination of the work of destruction as a function of velocity. In this connection they assume that on the occasion of the destruction of crystalline bodies (particularly mica) strong fields may occur in the interspace between the surfaces to be destroyed by the separation of the charges arranged in mosaic form. In the course of previous experiments the authors discovered an emission of electrons on the occasion of the destruction of mica, gypsum, and other crystals in a high vacuum (10^{-4} mm torr). N.A. KROTOV and V.V. KARASEV obtained pictures on the occasion of a repetition of these experiments which distinctly show that the maximum of radiation occurs in the interspace between the destroyed plates. Also the fission surfaces radiate electrons. Also in this case it was possible by the employment of suitable methods to observe the fine structure of the surfaces to be fissioned. In the case of a fission parallel to the fission surfaces fraying was noticed in gypsum. On the basis of their own previously carried out work on adhesion the authors assumed that the energy necessary to destroy mica must depend on velocity and that it also depends

Dokl. Akad. Nauk, 109, fasc. 4, 728-730 (1956) CARD 2 / 2

PA - 1433

on other factors as e.g. pressure and nature of the gas (in which destruction takes place). Experiments carried out in connection with the destruction of mica were undertaken by means of an adhesiometer with a rotating disk. The character of the adhesiograms differs with different pressures, and if pressure is reduced the work of fissioning increases. In the case of the fissioning of mica in an argon atmosphere the work function is less than in air, and this is the case at different pressures of the surrounding medium. Luminescence occurs within the domain of rapid stripping. Also in the case of the stripping off of films consisting of polymers from different carriers luminescence occurs in an argon atmosphere within the domain of rapid stripping. The modification of the work function under these conditions is based upon the influence exercised by argon on the amount of the discharge potential on the occasion of the drawing out of the coatings of the electric double layer.

It is interesting to compare the destruction of crystalline bodies with the tearing of rubber and some fibrous substances of the type of cardboard, for these substances show no traces whatever of electron emission when torn in a vacuum, as tearing takes place along the film of the high polymer in the case of not too large quantities of filling material.

INSTITUTION: Institute for Physical Chemistry of the Academy of Science in the USSR.

DERYAGIN, B.V.

B-14

USSR/Chemistry of Colloids - Dispersed Systems.

Abs Jour : Referat Zhur - Khimiya, No 6, 1957, 18778

Author : B.V. Deryagin.
Inst : Academy of Sciences of USSR.

Title : Theory of Sol Coagulation Taking into Consideration
Splitting Pressure and Mechanical Properties of Thin
Layers.

Orig Pub : Dokl. AN SSSR, 1956, 109, No 5, 967-970

Abstract : A correction for the decrease of the mobility of particles at their drawing together accompanied by the squeezing out of the medium from the space between particles was introduced into the theory of coagulation of dispersed system in presence of action-at-distance forces among particles, which theory had been developed by N. Fuks (Z. Phys., 1934, 89, 736). It was shown that this correction does not alter the order of the coagulation speed magnitude. In case that the medium viscosity at

- 333 -

Card 1/2

Deposition of aerosol particles on phase transition surfaces. Diffusional methods of dust collecting. Their significance in medicine. H. V. Karavich and S. S. Dukhin. Doklady Akad. Nauk S.S.S.R. 111, 613-16 (1958).—The jet imp of minute particles on phase transition surfaces is analyzed, and a new and effective method of dust collecting is designed from the formula derived. In all dust collectors the dust must be directed towards the collecting surface (the electrodes of the electrostatic filter, the droplets in the spray collector, the water film in the wet cyclone). For extremely small surfaces (order of 0.3 μ) difficulties are encountered, as discussed in Dukhin and Karavich (Doklady Akad. Nauk S.S.S.R. 1954, No. 11). Condensation surfaces on which the flow lines are closed, and on which the particles are carried without any expenditure of energy, can be used to advantage for collecting such particles. Such a method will be effective and universal when the effectiveness of other methods is limited by the properties of particles (their dispersion, electric charge, etc.): particles of any kind will be entrained and will settle upon the condensation surface. E.g., if into a previously humidified vol. of air in a cylindrical space cont. dust of all sizes, drops of a soln. are introduced of a size detd. by the effectiveness of capture of dust particles (in a unit time), an expression is derived for the vol. of purified air (Q) by using M.L. of the soln., with a droplet diam. of R₁, and the av. aerosol particle diam. R₂: $Q = (2M_1 D_0 \rho' / \rho'') / [R_1 (1 + R_2 / R_1)]$, where D is the diffusion coeff. of steam into air, ρ' is the difference in the steam concn. around the droplets and at an (infinite) distance from them, and ρ'' is the air d. The effect of a phase transition is discussed in its application to medicinal inhalations, the hygienic advantages of dry climates, and the high incidence of silcosis in mines with high-humidity air.

W. M. Sternberg

4E2a-1

✓ The adhesion and autohesion mechanisms in rubber. B. V. Derzavko, S. K. Zherobkov, and A. M. Mevrelava. *Doklady Akad. Nauk S.S.S.R.* 111, 1287-70 (1958).—The increase in rubber adhesion is attributed to the gradual development of the adhesive forces with the contact time, which is due (a) to the macroscopic increase to the total contact area resulting from the relaxation and plastic flow in the contact stress zone, and (b) to the microscopic mechanism of diffusional interweaving of the polymer chains, resulting in a cohesion through the disappearance of the physical separation boundaries (Jozefowitz and Mark, *India Rubber World*, 106, 33(1942)). An attempt is made to study separately the mech.-chem. and mech.-relaxation cohesion processes by investigating the adhesion of similar polymer and of different polymer combinations and comparing the adhesion values with the compatibility indices of the polymers. The adhesion (in kg./sq. cm.) was defined as the force needed to displace one sample against another. The same or different polymers were applied to cloth pieces, 6 X 11 cm. in size, the solvents were evaporated, and the strips were placed face-to-face under a load of 40 g./sq. cm. for 5 min. The results obtained show that the compatibility of the plastics, which is characterized by the adhesion resistance to shear, is dependably defined by their polarity relation.

W. M. Straker

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DERYAGIN, B. V.

PHASE I BOOK EXPLOITATION

609

Deryagin, B. V., Zakhavayeva, N. N., Talayev, M. V., and Filippovskiy, V. V.
Opredeleeniye udel'noy poverkhnosti poroshkoobraznykh tel po soprotivleniyu
fil'tratsii razrezhennogo vozdukha (Determination of the Specific Surface of
Powders on the Basis of Filtration Resistance to Rarefied Air) Moscow, Izd-vo
Akademii nauk SSSR, 1957. 59 p. 4,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut fizicheskoy khimii.

Ed. of Publishing House: Shteynbok, G. Yu.; Tech. Ed.: Polesitskaya, S. M.

PURPOSE: This pamphlet presents B. V. Deryagin's method of determining specific surfaces of porous and powdered substances for use in various fields of technology. It is meant for research workers and for workers in industrial laboratories.

COVERAGE: The authors describe Deryagin's method as a simplified and rapid method for the determination of specific surfaces of porous and powdered substances. The method is based on the theory of filtration of rarefied gases through porous media, taking into consideration the Knudsen flow. Chapter one gives a detailed description of the determination of the external specific surface from the steady state flow of rarefied air. The equation for the specific surface is:

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Determination of the Specific Surface of Powders (Cont.)

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$$S_0 = \frac{24}{13} \sqrt{\frac{2}{\pi}} \frac{\delta^2}{Q \sqrt{MRT}} \cdot \frac{\Delta p}{\Delta x}$$

expressed in $[S_0] = \frac{2}{3} \frac{\text{cm}^2}{\text{cm}}$;

where S_0 = 2 specific surface (in cm^2 per 1 cm^3 of the porous medium)

Q = quantity of moles of air flowing through 1 cm^2 of a porous layer Δx cm thick per second, with a pressure drop across the porous medium Δp dynes/cm²

δ = "porosity" equal the ratio of the pore volume to the total volume of the medium

M = mean molecular weight of air (29.3 g/moles)

R = universal gas constant (in erg/mole. degr.)

T = absolute temperature, °K

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Determination of the Specific Surface of Powders (Cont.)

609

The apparatus (Fig. 1, 2) was constructed at the Institute of Physical Chemistry, AS USSR. It does not require a skilled operator. The determinations can be accomplished in 20 to 30 minutes with an accuracy of 2 to 5 percent. The average porosity was accepted as 0.5. For certain powders, e.g., quartz, the specific surface value can be related to the 0.5 porosity value after introduction of a correction into the formula

$$S_o = K \frac{h_p \delta^2}{h_q \Delta x}$$

as suggested by S. G. Shvartser. This empirical correction equals 1 for $\delta = 0.5$:

$$S_o = K \frac{h_p \delta^2}{h_q \Delta x} \cdot \frac{\delta}{1-\delta} \quad [\text{Note: } x \text{ missing in text}]$$

where K = constant of the apparatus

h_p = pressure drop across the sample (in cm)

h_q = flow-meter reading (in cm).

Table 6 gives a comparison of results obtained by means of the Deryagin method with Card 3/6

Determination of the Specific Surface of Powders (Cont.)

609

results from several other methods used for the determination of specific surfaces of carbon blacks (investigators: Tesner-Polyakova, Brunauer-Emmet-Teller, Harkins-Jura, Zuyev-Mikhaylov, Laboratory of Academician A. N. Frumkin, Laboratory of Academician M. M. Dubinin).

Part II describes the determination of the total specific surface of porous media and powders based on the transient filtration of rarefied air (Knudsen flow). The total surface includes surface areas of blind pores and channels. The equation used is

$$S_1 = \frac{144}{13} \frac{\delta}{1 - \delta} \frac{L}{x^2} \sqrt{\frac{2RT}{\pi M}}$$

where S_1 = specific surface in cm^2 per 1 cm^3 of the porous medium

δ = porosity, equal void volume/total volume

x = height of the sample (cm)

L = time lag (sec.)

M = molecular weight of the gas (g./moles)

R = universal gas constant (erg/mole.degr.)

T = absolute temperature, °K

and $[S]$ = $\frac{1}{\text{cm}}$.

Card 4/6

Determination of the Specific Surface of Powders (Cont.)

609

The results obtained are in good agreement with results of the nitrogen-adsorption method. Table 7 gives data obtained by means of various methods (transient flow of air, Deryagin's steady state flow, nitrogen-adsorption method). Fig. 9 and 10 show the apparatus used in the transient flow method. Appendix 1 contains detailed instructions and Appendix 2 has diagrams of details of Deryagin's apparatus. Deryagin's method permits the determination of specific surfaces of fine and coarse dispersed materials, and the difference between results obtained from the steady state and transient flows gives the specific surface of blind pores and channels. There are 28 figures, 9 tables, and 18 references, 5 of which are English, 1 German, and 12 Soviet.

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DERYAGIN, B. V., PROKHOROV, P. S., IZMAILOVA, B. V.

"Influence of Adsorption Layers on the Growth of Condensation Nuclei in a Super-Saturated Atmosphere," paper to be presented at the 2nd International Congress on Surface Activity, International Union of Pure and Applied Chemistry, London, 12 April 1957.

Phys. Chem. Lab. of Surface Phenomena AS USSR

DERYAGIN, B. V.

"Computation Method of Separation of Capillary Condensation and Adsorption in Porous Bodies According to Experimental Data," paper to be presented at the 2nd International Congress of Surface Activity, International Union of Pure and Applied Chemistry, London, 12 April 1957.

Inst. Physical Chemistry, AS USSR

DERYAGIN, B. V., ZORIN, Z. M. and KARAS'YEV, V. V.

"Properties of the Polymolecular Boundary Layers^{to be} of Liquids According to Absorption and Viscosimetric Measurements," paper presented at the 2nd International Congress of Surface Activity, International Union of Pure and Applied Chemistry, London, 12 April 1957

Inst. of Physical Chemistry, AS USSR

DERYAGIN, B. V., KROTOVA, N. A. and KARAS'YEV, V. V.

"Electric Phenomena Accompanying the Formation of New Interfaces and Their Role in Adhesion and Cohesion," a paper to be presented at the 2nd International Congress of Surface Activity, International Union of Pure and Applied Chemistry, London, 12 April 1957

Inst. Physical Chemistry, AS USSR

DERYAGIN, F. V.

with Karasev, V. V., "Die Untersuchung der Viscositat von Flussigkeitsgrenzschichten nach der "Wegblesmethode."

with Abrikosov, I. I., "Die Messung der molekulen zwischen festen Koerpern bei Grossen Abstanden."

with Izmaylov, G. I., and FROKHOROV, P. S., "Moglichkeit der Oberlachen-Aktivierung und Passivierung von Reimen fuer Wasserdampf-Kondensation."

papers delivered at the Intl. Cong..on Surface Activity , London, 8-12 April 1957.

Angewandte Chemie, No. 16, 1957.

DERYAGIN, B. V. and TITEYEVSKAYA, A. ⁵B.

"Static and Kinetic Stability of Free Films" a paper submitted at
2nd International Congress on Surface Activity, 8-12 Apr 57, London.
Deryagin, and Titeyevskaya, Academy of science, Institute of Physical Chemistry,
Bolshaya Kalozhskaya 31, Moscow, USSR.

E-5972

DERYAGIN, B. V. (Prof.) and LADAREV, V. P.

"Investigation of Boundary Lubrication in Kinetic Friction by Means of a Wire Tribo-Meter,"

paper presented at the Conference on Lubrication and Wear, held at the Inst. of Mechanical Engineers, London, 14 Oct 57

Trans - A-3099501, 27 Feb 58

DERYAGIN, B. V.

"Theory of Stick-Slip Sliding of Solids,"

paper submitted for presentation at the Conference on Lubrication and Wear, London,
1-3 October 1957.

The Chartered Mechanical Engineer, Sep 57, p. 340-42.

DERYAGIN, B. V.

137-58-5-10610

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 5, p 249 (USSR)

AUTHOR: Deryagin, B. V.

TITLE: A Contribution to the Theory of Friction (K teorii treniya)

PERIODICAL: V sb.: Razvitiye teorii treniya i iznashivaniya. Moscow.
AN SSSR, 1957, pp 15-26

ABSTRACT: An examination of the major stages in the development and the present status of the theory of boundary friction (BF). BF is defined as the extreme condition of friction (F) in which the rate of slide becomes so small that the effect of fluid-film viscosity upon F may be ignored and the clearance becomes so small that the interaction between the surfaces of F and the layer of liquid separating them where the clearance is smallest becomes the decisive factor. The development of a quantitative theory of BF encounters great difficulties, occasioned by the inadequacy of our knowledge of the structures and properties of those poly-molecular boundary films which lie within the range of influence of the solid surfaces. In order to understand the total concatenation of phenomena accompanying BF, it is necessary in the first place to take into consideration the orientation of the

Card 1/2

137-58-5-10610

' A Contribution to the Theory of Friction

. elongated active molecules that enter into the composition of lubricants in polymolecular boundary strips at their interfaces with solid walls. It is shown that further development of the mathematical theory of boundary friction requires a development of the hydrodynamics of an anisotropic liquid. the properties of which differ along two mutually normal directions as do the elastic properties of analogous crystals. Bibliography. 21 references.

L. G.

1. Friction--Theory

Card 2/2

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SOV/124-59-9-10352

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Translation from: Referativnyy zhurnal, Mekhanika, 1959, Nr 9, p 113 (USSR)

AUTHORS: Vlasenko, G.Ya., Deryagin, B.V., Kudravn'tseva, N.M., Prokhorov, P.S., Storozhilova, A.I., Churakov, V.V.

TITLE: Flow Methods for Investigating Atmospheric Aerosols ¹⁷

PERIODICAL: V sb.: Issled. oblakov, osadkov i grozovogo elektrichestva. Leningrad, Gidrometeoizdat, 1957, pp 185 - 188

ABSTRACT: Not only the number of particles within the volume unit, but also their dimension distribution can be determined by the ultramicroscopic flow investigation method. For this purpose, an optical discriminator (photometric wedge), making it possible to obtain the particle-brightness distribution, was mounted into the target illuminating device of an ultramicroscope. A new wedge-graduation method is described; the graduation curves of the dependence of particle dimensions on the wedge position can be obtained quickly, when applying the method mentioned. The authors report on the flow method applied to the study of the atmospheric condensation nuclei. For this purpose, a simple

Card 1/2

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SOV/124-59-9-10352

Flow Methods for Investigating Atmospheric Aerosols

accessory device is developed for "revealing" the condensation nuclei containing in the atmosphere. This accessory device consists of an air-moistening chamber and a cooling channel, in which vapor condensation on the condensation nuclei proceeds. The condensation nuclei, enlarged in this way, are carried away by the air current, arrive at the cell of the ultramicroscope, and can be recorded by the observer. The optimum operation conditions of the device were determined experimentally. By the ultramicroscopic flow method, the automation of registering aerosol particles or "revealed" condensation nuclei can be brought about. The design of an automatic counter developed for this purpose is presented. This counter carries out the registration of aerosol particles of high numerical concentrations without failing.

S.V. Severin

Card 2/2

X

124-58-9-10057

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 88 (USSR)

AUTHORS: Batova, G. A., Deryagin, B. V., Leonov, L. F., Nikol'skiy, A. P.,
Prokhorov, P. S.

TITLE: Diffusion Hygrometers (Diffuzionnyye gigrometry)

PERIODICAL: V sb.: Issled. oblakov, osadkov i grozovogo elektrichestva.
Leningrad, Gidrometeoizdat, 1957, pp 189-191

ABSTRACT: Bibliographic entry

1. Hygrometers--Equipment 2. Diffusion

Card 1/1

DERYAGIN, B. V.

Structural peculiarities of boundary layers. B. V. Deryagin
(Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow).
Pis'ma v Zhurn. Sovetsk. i Razv. fiziko-khim. i matemat.
fiz., Sbornik Trudov Konferentsii, Adressovaniy 1957, vol. 1,
pt. 1, No. 49, 8150g. A. P. ...

Ver yagin, R. U.

21
FEDERAL BUREAU OF INVESTIGATION
U. S. DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535
Phone: (202) 452-4000 (English) or (202) 452-4001 (Russian)
B. M. J.

DERYAGIN, B.V.

USSR/Atomic and Molecular Physics - Physics of High-Molecular Substances

D-9

Abs Jour : Ref Zhur - Fizika, No 1, 1958, 852

Author : Deryagin, B.V.

Inst : -

Title : On the Applicability of the Binomial Law Friction to the Friction of Rubber.

Orig Pub : Kolloid. zh., 1957, No 3, 398

Abstract : No abstract.

Card 1/1

DERYAGIN ET AL

21 30

✓ Direct measurement of molecular attraction of solid
media. II. Method of gap-measurements. Results of
experiments. I. I. Abrisova and B. V. Deryagin.
Soviet Phys. JETP 4, 2-11 (1957) (English translation).
See C.A. 51, 43f. B. M. R.

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DERYAGIN, B.V.; ZAKHAVAYEVA, N.N.; TALAYEV, M.V.; LOPATINA, A.M.

Apparatus for determining the filtration coefficient and capillary permeability of porous and dispersed bodies. Trudy Inst. fiz. khim. no.6:123-130 '57. (MIEA 11:10)
(Capillarity--Measurement)

DERYAGIN, B.V.; ZAKHAVAYEVA, N.N.; TALAYEV, M.V.; FILIPPOVSKIY, V.V.

Methods and apparatus for measuring the specific surface (or dispersity) of porous bodies and dispersed materials by the filtration rate of rarefied air. Trudy Inst. fiz. khim. no.6: 131-139 '57. (Porosity--Measurement) (MIRA 11:10)

IZMAYLOVA, G.I.; PROKHOROV, P.S.; DERYAGIN, B.V.

Flow method for measuring critical supersaturation for condensation
centers. Trudy Inst. fiz. khim. no.6:158-161 '57. (MIRA 11:10)
(Condensation)

DERYAGIN, B.V.

49-6-8/21

AUTHORS: Deryagin, B. V. and Dukhin, S. S.

TITLE: On the influence of thermophoresis on the coagulation of cloud drops. (O vliyani termoforeza na koagulyatsiyu oblachnykh kapel').

PERIODICAL: "Izvestiya Akademii Nauk, Seriya Geofizicheskaya" (Bulletin of the Ac.Sc., Geophysics Series), 1957, No.6, pp. 779-784 (U.S.S.R.)

ABSTRACT: The influence of thermophoresis forces is investigated on the movement of aerosol particles in conjunction with a temperature drop in the neighbourhood of mist drops. The authors restrict themselves to the temperature field and consequently to the thermophoresis forces in the neighbourhood of the drops, the dimensions of which do not exceed several tens of μ since with a decrease in the drop dimensions, other conditions remaining equal, the thermophoresis force increases and the considered problem can be solved more simply if this simplification is valid. The convective heat transfer and the convective diffusion during the fall of particles of such dimensions can be disregarded and the temperature field and the vapour concentration in their neighbourhood can be considered as being spherically symmetrical. The investigation in this

Card 1/2

49-6-8/21

On the influence of thermophoresis on the coagulation
cloud drops. (Cont.)

paper is theoretical. The thermophoresis force between two
particles is expressed by eq.(16), p.782. It is concluded
that the radiometric force does not have any appreciable
influence on the coagulation of the electrically charged
particles. The thermophoretic repulsion force caused by the
radiation of the Sun can prevent coagulation of cloud
droplets even in the case of very low charges.
There are 1 table and 5 references, 2 of which are Slavic.

SUBMITTED: February 23, 1956.

ASSOCIATION: Institute of Physical Chemistry, Ac.Sc., U.S.S.R.
(Akademiya Nauk SSSR Institut Fizicheskoy Khimii).

AVAILABLE: Library of Congress

Card 2/2

DERYAGIN, B.V.

Handwritten: ~~from~~ 7

✓ Theory of Slipping and Periodic Sticking of Solid Bodies (Friction and Oscillations of the First Kind). I - General Condition for Occurrence of Sticking. B. V. Deryagin, Y. R. Bush, and D. N. Tolstol. *Soviet Physics - Tech. Physics*, No. 6, 1957, pp. 1,300-1,312. Translation. Includes discussion of the physical nature of the phenomenon, quantitative treatment of an elastically-coupled slide moving over a plane, and calculation of the dependence of the static friction on the duration of the sticking.

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DERYAGIN, B. V.

Study of adhesion effect of the attachment of rubber to metal by Lenton, G. A. M. Medvedev, B. V. Deryagin, and S. K. Zhurav (Inst. Rubber Ind., Moscow). *Russid. Zhur.* 19, 4, 228 (1957). — A rubber made of Nairit II 10%, ZnO 8, MgO 2, stearic acid 1, and C black (I) 50 parts was glued to steel with (OCNC₁₀H₁₈CH₃) (II); the curing conditions were those used in the vulcanization of the rubber. The work *W* of peeling these joints increased with the rate of peeling, e.g., 10-fold when it rose from 0.002 to 0.5 cm/sec. and was smaller than without I, if I was "active" (channel black, lampblack); if I was "inactive" (thermal black (III)), *W* was greater than without I and was almost independent of I. Channel black lowered *W* and caused the sepn. to occur at the steel surface also in butadiene-nitrile rubber, natural rubber, and butadiene-styrene rubber, while III increased *W* and resulted in its sepn. at the rubber. Heating of II alone had no effect, but heating of II with channel black reduced the no. of free NCC₂ groups, e.g., by 19% in 4 hrs.; heating of II with III did not change this no. For Butyl rubber, *W* was raised by III more than by channel black. The *W* for Nairit rubber contg. channel black was increased almost 100-fold when the steel was sandblasted, but sandblasting had a small effect on *W* for Nairit rubber contg. III and for Butyl rubber contg. channel black. The *W* is large when the interaction between steel and II is as strong as between II and rubber.

J. J. Eikermann

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4220 (j)
2 May

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~~DERYAGIN, B.V.~~

Applicability of the binomial friction law to the friction of
rubber. Koll. zhur. 19 no.3:398 My-Je '57. (MLRA 10:8)
(Rubber) (Friction)

DE 799

Distr: $4E4j/4E2c(j)/4E3d$

✓ The possibility of surface activation and passivation of nuclei in the condensation of water vapor. G. I. Livshova, P. S. Prokhorov, and B. V. Duzhagin (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *Kolloid. Zhur.* 11, 536-81 (1937).—A stream of dry air (m_1 moles/sec., H_2O vapor pressure = p_1) was mixed with a stream of moist air (m_2 moles/sec., H_2O vapor pressure = p_2), and p_2 was varied until visible fog appeared in the mixing chamber; the supersat. S corresponding to fog formation was calc. as $S = (m_1 p_1 + m_2 p_2) / p_2 (m_1 + m_2)$; $p_2 = \text{satd. vapor pressure at the mixing temp.}$ When NaCl crystals (obtained by vaporization of drops of dil. NaCl solns.) were introduced in the dry stream, the S was greater (0.84 to 1.33), the smaller was the approx. radius of the crystals (0.2 to 0.038 μ). When H_2O was adsorbed on the crystals, before the expt., S increased by, e.g., 40%, but $(Et_3Si)_2O$, CO_2 , and iso-AmOH lowered S . A SiO_2 powder contg. about 2% Na_2CO_3 and 8% $CaCO_3$ was heated to 121-732° before the expt.; heating raised S up to 4-fold. The chem. or thermal treatment of the condensation nuclei changes the accommodation coeff. on them. I. J. IBERMAN

7
2 May
3

Institut fizicheskoy Khimii AN SSSR,
Moskva. (atmospheric nucleation)
(Vapor)

DERYAGIN, B. V.

5

Automatic recording diffusional humidity meter. A. P. Nibolskii, B. V. Deryagin, P. S. Prokhorov, and G. A. Batova. *Zhurnal Fiz. Khim.* 33, 497-500 (1959); cf. *C.A.B.* 43, 1038-40. -- The app. was constructed for moisture detn. in a gas by measuring convection diffusion through a porous membrane with a por. diam. considerably larger than the mean free path of the dry air and steam molecules. A chamber with some hygroscopic substance (LiCl or CaCl₂) was tightly covered with a plate of material contg. fine pores (compressed graphite, porcelain, etc.) and placed in the moist air. The pressure inside the chamber decreased owing to the absorption of water vapor, and some moist gas diffused through the membrane. The partial pressure difference of dry gas inside and outside the chamber was a function of the water vapor pressure in the moist gas, and the coeff. of proportionality between the total and partial pressures at the two sides of the membrane (depended on the diffusion coeff. and the viscosity of the gas mixt. The app. built is fully illustrated and described. The time between LiCl changes (40 g.) depends on conditions and may be several weeks at a temp. of 40°, and only 10-12 days at 80°. H in the gas may introduce errors. The app. was used for moisture regulation in blast-furnace air, and was found to offer advantages over other instruments. W. M. Sternberg

*Cent. Lab. of Automatics,
Min. Ferrous Metallurgy USSR*

JK

DERYAGIN, B.V.
AUTHOR: DERYAGIN, B.V., KARASEV, V.V., ZAKHAVAYEVA, N.N., PA - 3563
LAZAREV, V.P.
TITLE: Mechanism of Boundary Lubrication and Boundary Lubrication Layer
Properties. (Mekhanizm granichnoy smazki i svoystva granichnogo
smazchnogo sloya, Russian)
PERIODICAL: Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 5, pp 1076 - 1086 (U.S.S.R.)
ABSTRACT: There are two different opinions concerning this problem: that of
close and that of remote effect. The former is expressed by Bowden
(The Friction and Lubrication of Solids, Oxford, II. ed., 1954),
the latter by the authors of this paper. The latter opinion is
based on numerous theoretical and experimental investigations
carried out according to entirely new methods. It says that the
influence exercised by the solid wall is continued into the interior
of the liquid which in the depth of many molecular layers contains
polar molecules, and in this way causes a change of the properties
of these layers compared to those of the space phase. This exercises
a considerable influence on the boundary lubrication. A short sur-
vey of all those facts is given on the basis of which the difference
of opinion mentioned above must be decided in favor of the opinion
expressed by the authors. Direct measurements of the viscosity in
boundary layers of organic liquids, oils, and polymers according
to the latest and greatly improved methods showed clearly that in

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PA - 3563

Mechanism of Boundary Lubrication and Boundary Lubrication Layer Properties.

boundary layers with a thickness of up to $0,1\mu$ viscosity has a value that differs greatly from the space value. These results show that Bowden's opinion is wrong. In order to explain the static friction of solid surfaces separated by a boundary-polymolecular layer, the equation for static friction F is written down according to the two-term friction law:

$$F = \mu (N + Sp_0) = \mu N + S \theta \quad (\theta = \mu p_0)$$

μ is the "true" friction coefficient, N - stress, S the surface of the true and molecular contact, and p_0 - the constant of the pressure difference which measures the molecular force of attraction acting upon the surface unit of the true and molecular contact. Bowden explains frictional phenomena only with the help of the second term of this formula, and this is his mistake, for it is just the second term that explains the existence of static friction and confirms Amanson's law of friction. (With 12 illustrations and 14 Slavic references)

ASSOCIATION: Institute for Physical Chemistry, Moscow
 PRESENTED BY:
 SUBMITTED: 1.11.1956
 AVAILABLE: Library of Congress
 Card 2/2

DERYAGIN, F. V.

AUTHOR: KOTOVA, L. I., DERYAGIN, B. V. 57-6-17/36
TITLE: Theory of Cylinder Rolling on a Surface covered with a Plastic Lubricant. (Teoriya kacheniya tsilindra po poverkhnosti, pokrytoy sloyem plastichnoy smazki, Russian)
PERIODICAL: Zhurnal Tekhn. Fis. 1957, Vol 27, Nr 6, pp 1261-1271 (U.S.S.R.)
ABSTRACT: Formulae are derived for the determination of the pressure of the lubricant layer, the carrying strength of the lubrication layer and the power which is used for overcoming friction in the lubricating layer, i.e. for the case of a constant exterior shearing strain. A formula is determined for the pressure distribution in the lubricating layer for that case in which the shearing strain depends exponentially on pressure. It is shown that in this case there exists an utmost minimum thickness of the lubricating layer in the gap between the cylinder and the rolling surface. (With 10 Illustrations and 1 Slavic Reference).
ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED: 11.1.1957
AVAILABLE: Library of Congress
Card 1/1

Deryagin, B.V.
AUTHORS

Deryagin, B.V., Bakanov, S.P.

57-9-18/40

TITLE

The Theory of Gas Flow in a Porous Body in the Vicinity of Knudsen's Region.
(Teoriya techeniya gaza v poristom tele v okolo-knudsenovskoy oblasti.)

PERIODICAL

Zhurnal Tekhn. Fiz., 1957, Vol.27, Nr 9, pp.2056-2070 (USSR)

ABSTRACT

A highly porous body can, in the case of the lack of any porous structure and any regularity with respect to the arrangement of particles, be looked upon as a system of chaotically distributed spheres which are rigidly fixed in space. For a gas flow through such a system the method for the determination of the coefficient of the reciprocal diffusion of two gases, which was developed by S.Chapman and I.G. Cowling (The Mathematical Theory of Non-Uniform Gases, Cambridge, 1939) can be applied, in which case the spherical system is considered to be a gas with molecules of infinitely large mass. A formula for the gas filtration coefficient through the porous body is derived. It is shown that, with any approximation with the exception of that to zero, the filtration coefficient decreases with rising pressure. In consideration

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57-9-18/40

The Theory of Gas Flow in a Porous Body in the Vicinity of Knudsen's Region.

of the fact that the filtration coefficient at high pressure increases with rising pressure according to Poiseuille's law, a curve with a minimum is obtained. In this way it appears possible to explain the minimum in the gas-consumption-pressure curve in the case of the experiments carried out by Knudsen and W. Gaede (Ann. d. Phys., 41, 289, 1913) (M. Knudsen, Ann. d. Phys. 28, 75, 1909). The curves for the filtration coefficients obtained here differ only little within the domain concerned from those obtained on the basis of a much less accurate but physically clearer considerations. The results obtained here are applicable in the case of the condition,

$$\frac{\lambda_0}{\lambda_g} \ll \frac{\delta}{1 - \delta}, \text{ where } \delta \text{ denotes the porosity}$$

coefficient, λ_0 - the average length of path of the

CARD 2/3

57-9-18/40

The Theory of Gas Flow in a Porous Body in the Vicinity of Knudsen's Region.

molecules between collisions with the wall, λ_g - the length of path of the gas molecules.

There are 2 figures and 3 Slavic references.

ASSOCIATION: Institute for Physical Chemistry AN USSR,
Moscow.
(Institut fizicheskoy khimii AN SSSR, Moskva.)

SUBMITTED: March 15, 1957.

AVAILABLE: Library of Congress.

CARD 3/3

DERYAGIN, B.V.

Determination of the structural characteristics and the specific surface of porous substances using the desorption isotherms. Zhur. fiz.khim. 31 no.2:516-519 F '57. (MIRA 10:9)

1. AN SSSR, Institut fizicheskoy khimii.
(Porosity) (Desorption)

DERYAGIN, B. V.

5

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✓ 1914. THEORY OF THE LARGE-DISTANCE INTERACTION
 BETWEEN EVAPORATING OR GROWING DROPS.
 S.S. Dukhin and B.V. Deryagin.
 Dokl. Akad. Nauk SSSR, Vol. 112, No. 3, 497-11 (1957). In Russian.
 In a previous paper (Deryagin and Dukhin, Dokl. Akad. Nauk
 SSSR, Vol. 108, No. 5, 851, 1956) the authors evaluated the forces of
 attraction or repulsion, acting between the fog droplets or between a
 drop and a continuous liquid surface and affecting considerably the
 motion of the drops in relation to the medium. In the first approxi-
 mation, however, the forces of diffusion were found to be compen-
 sated by the effect of Stefan's law. In the present paper the authors
 introduce the factor of heat transfer which, as a rule, disturbs this
 compensation; the diffusion forces are shown to be able to influence
 substantially the precipitation and coagulation of the particles.

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MTT

AUTHOR

DERYAGIN B.V., Corresponding Member of the Academy of Sciences of the U.S.S.R.

~~PERIODICAL~~
20-4-34/61

TITLE

The Correct Form of the Equation of the Capillary Condensation in Porous Bodies In Its Application to the Determination of the Structure from the Isothermal Lines of the Adsorption and Sorption, and Vice Versa.

PERIODICAL

(Korrektnya forma uravneniya kapillyarnoy kondensatsii v poristykh telakh v primeneni k opredeleniyu ikh struktury po izoternam adsorptsii i sorbtsii i obratno -Russian)
Doklady Akademii Nauk, 1957, Vol. 113, Nr 4, pp 842-845 (U.S.S.R.)
Received 6/1957
Reviewed 7/1957

ABSTRACT

The paper under review derives the above equation. It can be rigidly applied when it is possible to neglect the influence of the curvature of the pore walls upon the adsorption equilibrium. The author investigates in his paper the equilibrium of the adsorbent with the vapor under the pressure p. Here the virtual process of "desorption" by an isothermal reversible distillation into the liquid phase with the vapor pressure p_0 is investigated. Different equations are written down, namely: for the change in the volume which is filled by the capillary condensed phase, for the corresponding increase in the free energy dU, for the free energy U itself; After several steps of computation, we finally obtain the following equation: $(\mu_0 - \mu)dW = -(\omega - \omega_0)dS - \sigma ds - dF$. In this equation, μ and μ_0 stand for the chemical

Card 1/3

The Correct Form of the Equation of the Capillary Con- 20-4-34/61
densation in Porous Bodies In Its Application to the Determination
of the Structure from the Isothermal Lines of the Adsorption and
Sorption, and Vice Versa.

potential of the vapor at the pressures p and p_0 , respectively; W
denotes the absorption in moles; ω_0 and ω stand for the free energy
of the unit of area of the separation area of the absorbent and the
liquid phase, and of the absorbent and the vapor with the pressure p ,
respectively; σ denotes the surface tension of the liquid at its bound-
dary with the vapor; s stands for the total area of the meniscuses in
the state under consideration, and s_0 denotes the same at $p=p_0$; F is
the surplus of the in the volume contained free energy of the capilla-
ry condensed liquid as compared to the spatial phase. Then this equa-
tion is discussed and possibilities to simplify it are indicated. The
author of the paper under review uses this equation for the solution of
the following problems: (1) Determination of the isothermal line of
the absorption of vapors by a porous body with given structure charac-
teristic; (2) Determination of the structural characteristic of a po-
rous body; (3) Determination of the width of the pores from the absorp-
tion isothermal line at a porous body with known structure; (4)
Determination of the isothermal line of the adsorption from the ob-
servations of the absorption at the existence of capillary conden-
sation in a porous body with known structure.
(2 reproductions).

Card 2/3
2

Quart. Phys. Chem., AS USSR

DERYAGIN, B.V.

20-1-34/54

AUTHOR: Dukhin, S.S., Deryagin, B.V., Corresponding Member of the Academy of Sciences of the ~~USSR~~

TITLE: A Theory of the Interaction Force Between Drops at Rest at Any Distance at Psychrometric Temperature
(Teoriya silovogo vzaimodeystviya pokoyashchikhsya kapel' na lyubom rasstoyanii pri psikhrometricheskoy temperature)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 1, pp. 126 - 129 (USSR)

ABSTRACT: The present work treats this interaction for the stationary and adiabatic course of the phase transition with regard to members small of first and second order in relation to $\lambda = \rho' / \rho'' \ll 1$. ρ' and ρ'' are the partial densities of the vapour and the air. With using the similarity of the heat-transfer- and diffusion processes we can easily show that in the case of an adiabatic course of the phase transition, that is to say in the case of lacking heat sources and heat transfer in drops, the temperature along the surface of the drop does not change and is equal to the psychrometric temperature. This causes an interesting characteristic of interaction and makes easier its investigation.

Card 1/2

20-1-34/54

A Theory of the Interaction Force Between Drops at Rest at Any Distance at Psychrometric Temperature

First the equations and boundary conditions for the field of velocities and diffusion current on the occasion of phase transition at the surfaces of spherical particles (drops) 1 and 2 with the radii R_1 and R_2 are put down. The Stefan's linear flow ($Re \ll 1$) of the viscous medium is, strange to say, a potential flow which makes easier the calculation of diffusion forces. After this a transformation of the equation for this potential ϕ is discussed. A formula is deduced for the force exercised on drop 2 by drop 1. The interaction of the drops in first approximation and with $Re \ll 1$ is at all distances equal to zero. This coincides excellently with the result of the direct calculation of the interaction of drops at great distances in first approximation as also this interaction is equal to zero. The authors find here an important analogy between the diffusion interaction and the electrostatic interaction. In the end the formula for the interaction of drops at great distances obtained from Coulomb's law is mentioned. There is no figure but there are 4 Slavic references.

SUBMITTED:
AVAILABLE:

January 29, 1957
Library of Congress

Card 2/2

DERYAGIN, B.V.

20-2-19/62

AUTHORS: Deryagin, B.V., Corresponding Member AN USSR, and Bakanov, S.P.

TITLE: The Theory of the Flow of Gas in a Porous Body Near Knudsen's Domain. The Pseudomolecular Flow (Teoriya techeniya gaza v poristom tele v okoloknudsenovskoy oblasti. Pseudomolekulyarnyy potok)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 2, pp. 267 - 270 (USSR)

ABSTRACT: Two types of the flow of a gas in a porous body (or in individual capillaries) are known: the molecular flow and the viscous flow. In the case of the molecular flow the relation α = (number of the collision of the molecules among each other / number of the collisions onto the walls of the pores) is small. In the case of the viscous flow applies $\alpha \gg 1$ and then a velocity distribution develops in the pores. According to the general opinion the molecular flow with increasing gas pressure p and consequently also with increasing α gradually changes into the viscous flow, where the gas current Q monotonously (in the first approximation linearly) increases. This scheme is contradicted by the tests with round and especially with slit-shaped capillaries where a minimum of the de-

Card 1/3

20-2-19/62

The Theory of the Flow of Gas in a Porous Body Near Knudsen's Domain. The Pseudomolecular Flow

pendence $Q = Q(p)$ was noticed. The teoretical explanation of this minimum failed. In the case of the highly-porous bodies for which $1 - \delta \ll 1$ applies (δ - porosity) the body is characterized by two essentially different bodies: by the average inside width of the pores λ_c and by the avergae dimension D of the particles. In this connection apply $\lambda_c = 4V/S$, and $D = 4V_p/S$, and S - signifies the surface of the walls, V - the volume of the particles and V_p - the volume of the pores. Further $\lambda_c = \delta D/(1 - \delta)$ is found. Apparently $\alpha = \lambda_c / \lambda_g$ is valid, where λ_g signifies the ordinary range of the gas molecules at a given pressure. In the case of $1 - \delta \ll 1$ there exists a domain of the gas pressure in which the two conditions $\lambda_g \ll \lambda_c$ ($\alpha \gg 1$) and $D \ll \lambda_g$ simultaneously apply. The authors investigate the flow of the gas in the domain. The calculation is followed step by step. The similarity of the filtration coefficients found on this occasion for Kundsen's and for the pseudomolecular flow is a very unexpected and important result due to the essentially different mechanisms of this flow. There are 1 figure, 8 references, 3 of which are Slavic.

Card 2/3

20-2-19/62

The Theory of the Flow of Gas in a Porous Body Near Knudsen's Domain. The Pseudomolecular Flow

ASSOCIATION: Institute for Physical Chemistry AN USSR
(Institut fizicheskoy khimii Akademii nauk SSSR)

SUBMITTED: March 1, 1957

AVAILABLE: Library of Congress

Card 3/3

DERYAGIN, B. V.

20-6-10/47

AUTHORS:

Deryagin, B. V., Corresponding Member of the AK USSR,
Bakanov, S. P.,

TITLE:

The Theory of the Motion of Small Aerosol Particles in a Diffusion Field (Teoriya dvizheniya malykh aerazol'nykh chastits v pole diffuzii)

PERIODICAL:

Doklady AN SSSR, 1957, Vol. 117, Nr 6, pp. 959-962 (USSR)

ABSTRACT:

The problem arises whether a creeping and a "phoresis" exist which are caused by the concentration gradient. This would have to be taken into consideration in the construction of a theory for the behavior of aerosol particles in diffusion fields. But the strict gaskinetic calculation of such a "diffusion phoresis" is complicated by the fact that the distribution of the velocities of the gas molecules in a layer of the thickness depends on the particle's distance from the surface. But the problem is reduced in the case of $r \ll \lambda_1, \lambda_2$ when the distribution of the velocities of molecules impinging upon the surface of the particle is not disturbed by the existence of the particle. In this connection λ_1, λ_2 signify the lengths of path of the molecules. The authors here examine a mixture of the gases with the moles m_1 and m_2 at small gradients of the partial concentrations n_1 and n_2 . In this connection still applies $\text{grad}(n_1+n_2) = \text{grad } p/kT = 0$. The kinetic equa-

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20-6-10/47

The Theory of the Motion of Small Aerosol Particles in a Diffusion Field.

tions and an ansatz for their solution are given. The unknown functions are developed in series. The course of the calculation (by the method of successive approximation is followed step for step. The problem of the determination of the distribution functions is in any approximation reduced to the calculation of certain integrals. The distribution functions found here in first approximation described the field of the mutual diffusion of two gases. An aerosol particle in the diffusion field beside the Brownian motion also has an ordered velocity \vec{u} at which the momentum transferred upon the particle due to the molecule collisions is equal to zero. The authors here investigate small values of $\text{grad } n_1$ and disregard the terms proportional to u^2 and $u \text{ grad } n_1$. The numerical calculation for the mixture air-water vapor ($p=1 \text{ atm}$, $T=293^\circ\text{K}$) yields the velocities (with regard to the wall) $u'=1,47 \cdot 10^{-2}/l$ (cm/sec), where l signifies that distance in centimeters on which the relative moistness decreases from 100% to zero. Finally something is said on a phenomenon in a highly porous body in which the pseudomolecular type of the current is possible. There are 4 references, 3 of which are Slavic.

Card 2/2

Instit. Phys Chem AS USSR

DERYAGIN, B. V. and METZIK, M. S.

"The Effect of the Electric Forces in the Process of Splitting of Mica,"
paper presented at the Conf. on Mechanical Properties of Non-Metallic Solids,
Leningrad, USSR, 19-26 May 58.

DERYAGIN, B.V.

~~Redacted~~ V

28(6) 13 FASE I BOOK EXPLORATION 30/1/68

Sovetskaya po mironom isledovaniya struktury vysokomolekulyarnykh i poristyykh tel.

Metody isledovaniya struktury vysokomolekulyarnykh i poristyykh tel; trudy vuzovgo nauchnoy shkoly (seminara po izyucheniyu struktury i svoystv vysokeymolekulyarnykh i poristyykh tel); Transactions of the Second Conference) Moscow, Izdatel'stvo AN SSSR, 1958. 258 p. 2,000 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut fizicheskoy khimii and Institut khimii silikatov.

Prof. M. I. Khizins, M. M. Anandakrishnan; Ed. of Publishing House: Murmova, L. L.; Book. Ed.: Matveevich, S. M.

REMARKS: This book is intended for scientists, teachers and advanced students interested in the structural analysis of highly dispersed and porous bodies.

CONTENTS: This collection contains reports by members of various Soviet institutions of higher education: Institute of Physical Chemistry, AS USSR; Institute of Chemistry, AS Georgian SSR; Far Eastern Branch, AS USSR; Georgian Scientific Research Institute for Petrology, State Optical Institute; Leningrad Technological Institute; Moscow and Leningrad State Universities; Far Eastern Polytechnical Institute; "Agrophysical" Institute, and others. Introductory remarks were made by Professor S. A. Voropov, Director of the Institute of Silicate Chemistry. Apart from reports under the four subject divisions (see Table of Contents), the collection includes discussions, considerations and proposals adopted at the close of the conference.

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DERYAGIN, B.V.

AUTHOR: Vol'kenshteyn, M. V., Doctor of Physico-Mathematical Sciences SOV/30-58-9-41/51

TITLE: Investigation of Mechanical Properties of Non-Metals (Izucheniye mekhanicheskikh svoystv nemetallov) Conference in Leningrad (Konferentsiya v Leningrade)

PERIODICAL: Vestnik Akademii nauk SSSR, 1958, Nr 9, pp. 109 - 111 (USSR)

ABSTRACT: The Mezhdunarodnyy soyuz chistoy i prikladnoy fiziki i Akademiya nauk SSSR (International Society of Pure and Applied Physics and the AS USSR) held a conference from May 19th to 24th. A.F.Ioffe, Member, Academy of Sciences, USSR, made the opening-speech. Further reports were delivered by: S.N.Zhukov on the influence of time and temperature on the strength of a great variety of materials. B.V.Deryagin, M.S.Metsik on the part played by electric energies at the cleaving process of mica. A.V.Stepanov on the destruction modes of crystals. R.I.Garber, I.A.Gindin, L.M.Polyakov on the characterization of plastic deformations by means of the micro-fissures occurring.

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