

CA

2

The nature of aqueous solutions of soaps as surface-active semicolloids. P. A. Rebindin and N. N. Petrova. *Bull. acad. sci. U. R. S. S. C. Div. sci. math. nat., Ser. chim.* 1937, 1085-1100 (in English 1100-1). The mol surface properties of aq. soap solns, detg. the peculiar technologic properties of soaps, especially their detergent action, are examd. Solns. of the soaps, sodiums (hydrogenated sunflower oil) (I), Na oleate (II), sunflower oil (III), colophony (IV), acidol and saponin are measured nephelometrically to det. the change in colloidal properties as a function of concn. In the absence of hydrolysis, τ , ϵ , in the region of concd. solns. I has the greatest "optical colloidality," followed by II and III. The other 3 soaps possess weak colloidal properties. Hydrolysis appears in solns. of II at approx. $\epsilon = 0.06-0.1\%$ and in solns. of IV at $\epsilon = 10\%$. To prevent hydrolysis an alk. electrolyte (NaOH, Na_2CO_3) is added to raise the pH to a definite value, differing for the various soaps. Addn. of alk. or neutral electrolytes beyond this point causes colloidalization of the soln. to the point of complete coagulation of the soap.

John Luvak

AS 534 METALLURGICAL LITERATURE CLASSIFICATION

1937 1085-1100

01.441 Ser. QM. 151

1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3RD AND 4TH ORDERS

ed

Physical chemistry of the flotation process in its technical application. XIII. The influence of flotation reagents on the wettability of minerals and physical-chemical methods of investigation of the flotation process. P. A. Reblinder. *Gorno Obogatitel. Zhur.* 2, No. 2, 17-20 (1937); *Chem. Zentr.* 1938, II, 830; cf. C. A. 28, 2862; 31, 5921; 32, 2409. Phys.-chem. methods used in the investigation of flotation phenomena are described. M. G. Moore.

A 38-31A METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

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PROCESSES AND PROPERTIES INDEX

2

ca

Physical chemistry of surface phenomena and of dispersed systems, and their application in U. S. S. R., P. A. Republics, Poland, Czechoslovakia, Rumania, S. S. S. R., 1938, 431-04; Khim. Neft. Zhur. 2, No. 5, 16 (1939).—The importance of the properties of the phase surfaces, suspensions, foams, fogs, emulsions, etc., as well as numerous technical applications of these phenomena in the fields of flotation, lubricants, filters and pigments, dispersion of solid bodies, mech. treatment of metals, etc., are discussed. W. R. Hean

A 18-51A METALLURGICAL LITERATURE CLASSIFICATION

MATERIALS INDEX

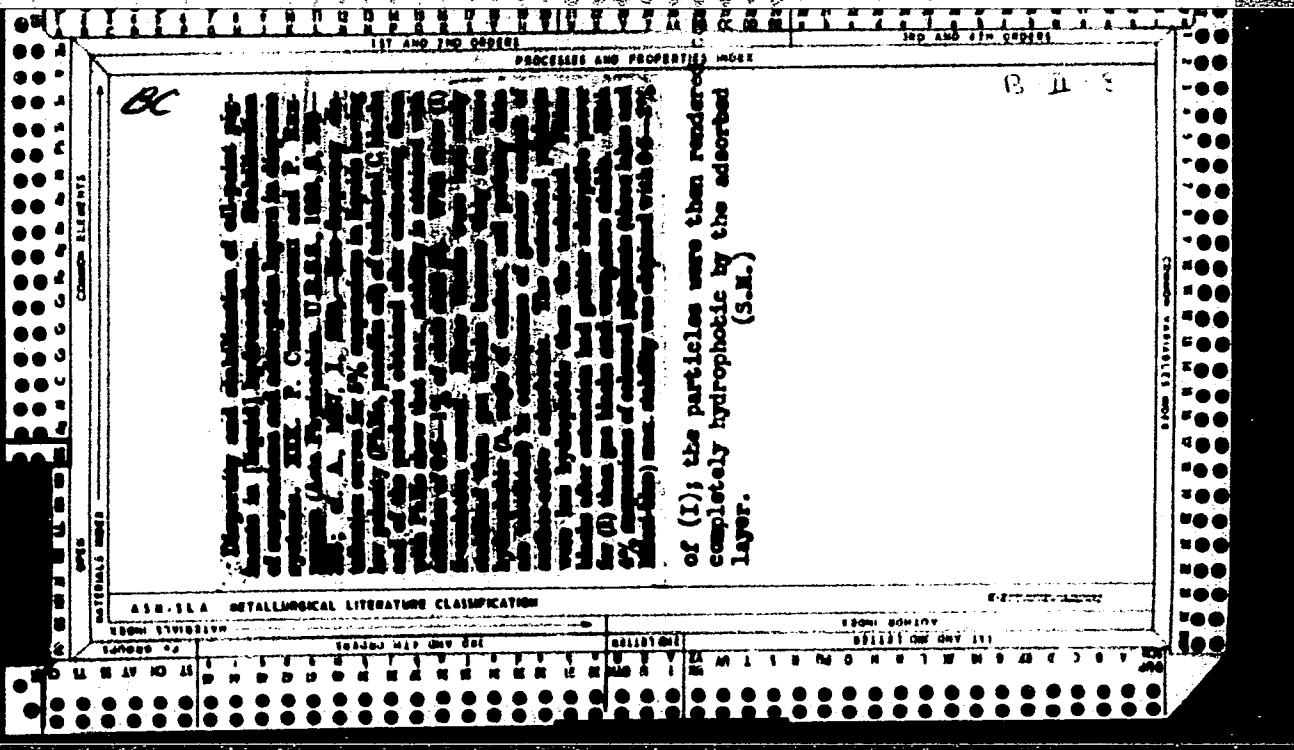
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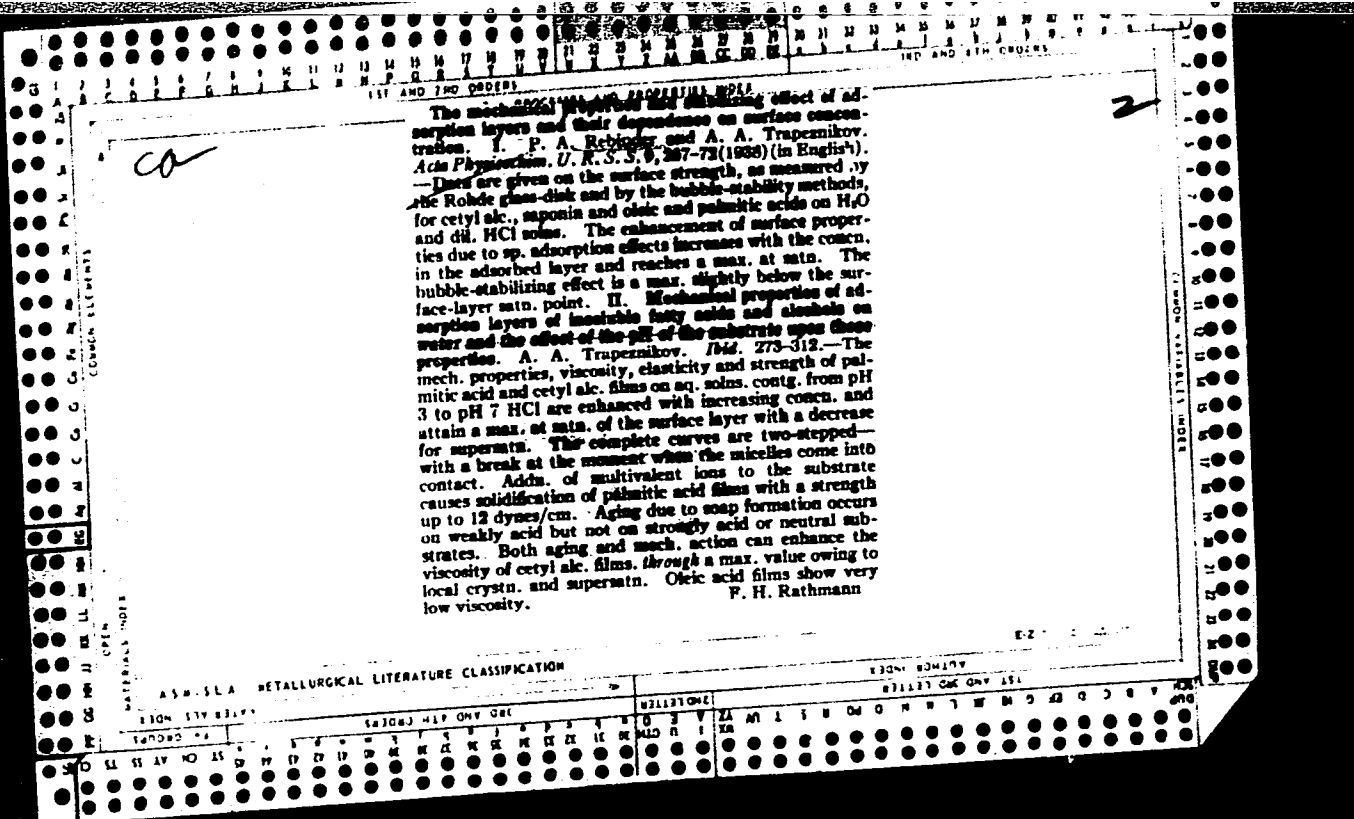
PROCESSES AND PROPERTIES OF RUBBER MIXTURES AND THE THEORY OF VULCANIZATION

10

Discussion of the thesis: "The activity and activation of the fillers of the rubber mixtures and the theory of vulcanization." P. A. Rebinder and V. B. Margaritov. *Caoutchouc and Rubber* (U. S. S. R.) 1938, No. 4, 3-6. G. Patrikeev. *Ibid.* 6-8. V. M. Fedorov. *Ibid.* 8-9. A. A. Dogadkin. *Ibid.* 9-14. D. M. Sandomirskaya. *Ibid.* 14. Yu. A. Klyachko. *Ibid.* 14-16. A. S. Galanov. *Ibid.* 16-18. B. A. Kagan-Sherima. *Ibid.* 18-19. L. Frunkin. *Ibid.* 19. P. A. Rebinder. *Ibid.* 19-21. A crit. discussion of the work of Rebinder, Margaritov and others, published under the general title of: "Surface phenomena in the technology of rubber" (C. A. 31, 37359, 38307, 52109, 38309, 45321, 65042, 82469) A. Postol

METALLURGICAL LITERATURE CLASSIFICATION





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1ST AND 2ND ORDERS

1ST AND 4TH ORDERS

2

ca

The mechanical properties of films and the stability of foams. P. A. Rebindey and A. A. Trapenikov. *Compt. rend. acad. sci. U. R. S. S. 18, 423-6 (1938) (in English)*.—The surface viscosity of Na oleate films reaches a max. at 0.055% oleic acid, corresponding to the satn. of the absorption layer. The surface viscosity decreases as the solns. age. The height of the foam increases to a const. value as the concn. of soap increases. After 22 hrs. the height vs. concn. curve displays a max. at about 0.04% oleic acid. S. Bradford Stone

Stabilizing effect of adsorption layers and their mechanical properties. A. A. Trapenikov and P. A. Rebindey. *Compt. rend. acad. sci. U. R. S. S. 18, 427-30 (1938) (in English)*.—The life of foam bubbles on surface films of Et palmitate, lauric, myristic, oleic and palmitic acids was observed. The bubbles have a max. life when the surface concn. is less than that of a satd. unimol. film. The stability increases with increasing length of hydrocarbon chain. Cholesterol decreases the stability of the bubbles. S. Bradford Stone

ASS. S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

E-2

PROCESSES AND PROPERTIES INDEX

26

Dependence of stabilization and wetting of particles suspended in oil medium on the quantity of surface-active substance adsorbed. P. Khomikovskii and L. Rehlander. (*Compt. rend. acad. sci. U. R. S. S. 18*, 375 8(1938)(in English); cf. *C. A.* **31**, 7723). - An investigation of the state of pigments in oil paints or printing inks according to the stabilization and consequent flocculation of the suspension in a hydrocarbon medium, with surface-active substances. Subinadder varnish, pink varnish, yellow varnish and Prussian blue suspensions were prepared in toluene or in a mixt. of toluene and pure vaschne oil. Pigment dispersion in the suspensions was measured with a vacuum sedimentometer. The quantity of oleic acid adsorbed by the pigments and the change in mol. nature of the pigments due to the adsorption of oleic acid were detd. All the pigments are well stabilized with oleic acid in a hydrocarbon medium; the stabilization limit is reached when no more oleic acid can be adsorbed by the pigments. A simple relation exists between the stabilization and wetting of the pigment particles and the quantity of stabilizer adsorbed.

M. McMahon

METALLURGICAL LITERATURE CLASSIFICATION

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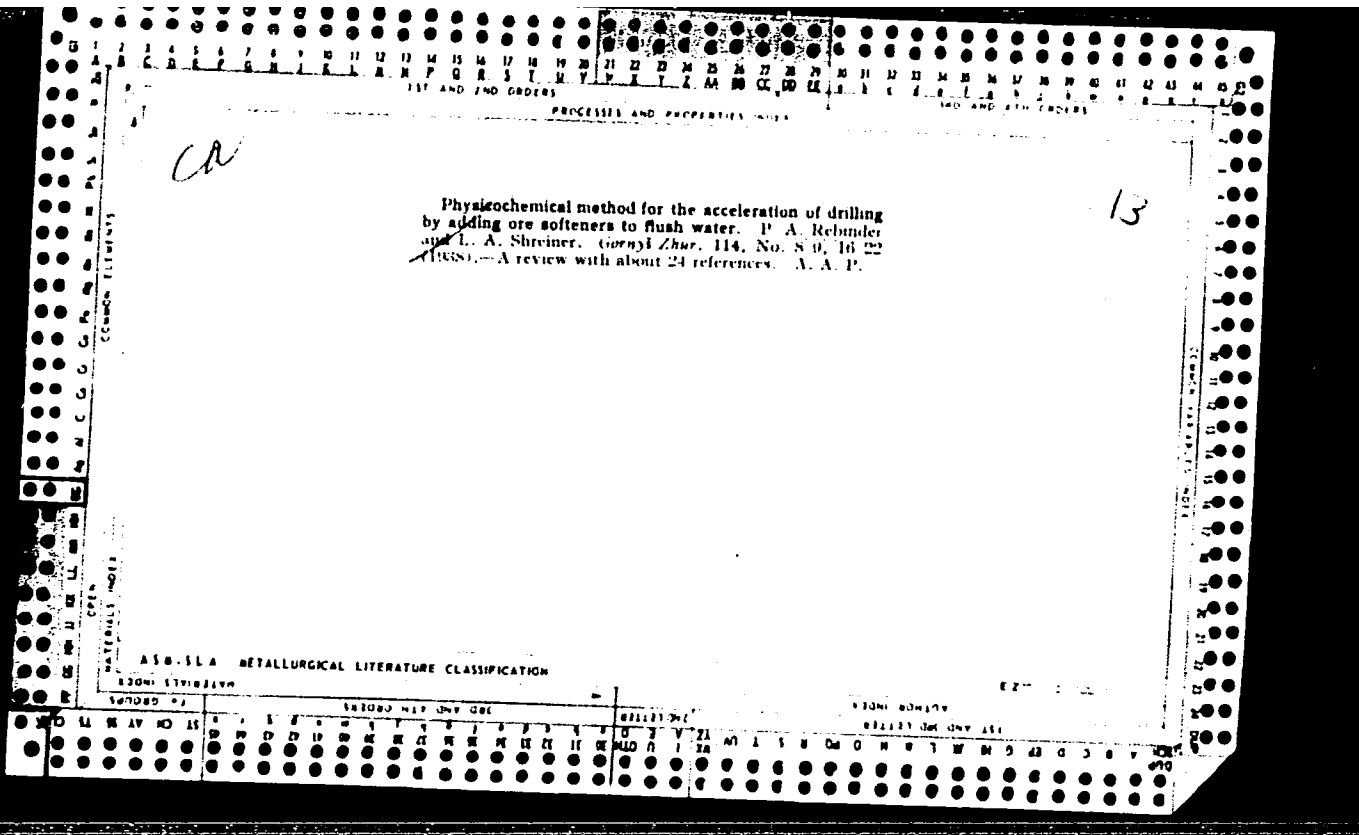
Effect of surface-active substances on structure formation in gelatin sols. K. F. Zhigach, P. A. Rebinder and G. G. Edel'man. *Compt. rend. acad. sci. U. R. S. S.* 21, 302-5 (1928) (in English).--Surface-active colloids, such as albumin, the sol. part of tragacanth and saponin, do not form gels in very low concns. (0.1, 0.5 and 1.5%, resp.) in water, whereas the surface-inactive colloids such as starch (0.1% in water), agar-agar and the slightly active gelatin (1% in water) do. In surface-inactive colloids the polar and nonpolar groups are apparently arranged symmetrically. Structure formation (e. g., gel formation) is more difficult the higher the concn. of surface-active fraction in a given sol, and the basis of gel formation is strong vol. solvation. Surface-active substances, such as EtOH, PrOH, BuOH and urea, when present in 0.5% and 0.75% gelatin sols decrease gel formation, as shown by viscosities taken at intervals up to 160 hrs., by union of their polar groups with the polar groups of the micelles. George Avera

2

METALLURGICAL LITERATURE CLASSIFICATION

A 58-55 A

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The physical-chemical fundamentals of abrasion phenomena of rubbing surfaces and of lubricants at high pressures. P. A. Rebjunet and N. N. Petrova. *Vsesoyuz. Konferents. Treniya i Iznos Mashinakh* 1, 484-504 (1939); *Khim. Referat. Zhur.* 1940, No. 7, 6-7.—At high pressures lubrication does not obey the ordinary hydrodynamic laws; beginning with a certain critical pressure the abrasion coeff. (which had been const. up to this point) increases suddenly and begins to be a function of the pressure.

This is caused by squeezing out of the lubricating films by the imbedding of bodies rubbing against each other and by the appearance of plastic deformations in the outside layers of the lubricating films. The critical pressure depends on the value of the limit of plastic flow of metals and can be increased considerably by the introduction of surface-active substances into the lubricant. These surface-active substances strengthen the adsorption of the lubricating film to the metal. The high "oiliness" of a good lubricant is caused by its high adsorption affinity to the surface lubricated. The decisive role of mol.-surface phenomena at the boundary of the metal and the surrounding medium was observed in the processes of fine cutting of metals. The cutting process is facilitated by formation and growth of micro cracks in the metal, decrease of the coeff. of outer friction at the boundary object-cutting tool-shavings and increase of the plastic flow of the metal treated. Methods for the selection, comparative evaluation and control of lubricating-cutting liquids are reviewed. There is observed an increase in the dispersing action of the surface-active substances during their fixation in the adsorption layer. W. R. Henn

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ZHIGACH, K.F.; REBINDER, P.A.

"The Surface Activity of Hydrophilic Colloids"; Zhur. Fiz. Khim., 12, No. 1, 1939.
Colloido-Electro-chemical Institute, Academy of Sciences USSR, Division of the Physico-chemistry of Dispersion Systems, Moscow. Rcd 21 May 1938.

Report U-1613, 3 Jan. 1952.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

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ca

2

Surface activity of hydrophilic colloids. K. F. Zhigach and P. A. Rebinde. *J. Phys. Chem.* (U. S. S. R.) 13, 94-105(1939).—Exptl. data on the formation of surface layers in gelatin, albumin, saponin, tragacanth, starch and agar agar sols at 20 and 35° are given in the form of surface-tension-time, σ - τ , curves. The $\log(\sigma-\tau)$ - τ functions for albumin are linear for concns. from 0.05 to 4.0%. The velocity consts. for the unimol. reactions vary with the temp. and with the colloid concn. P. H. R.

Common ELEMENTS

Common VARIABLES INDEX

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ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

RECOMMENDATION

1ST AND 2ND LETTERS

3RD LETTER

1ST AND 2ND ORDERS

3RD ORDERS

1ST AND 2ND LETTERS

3RD LETTERS

1ST AND 2ND ORDERS

3RD ORDERS

1ST AND 2ND LETTERS

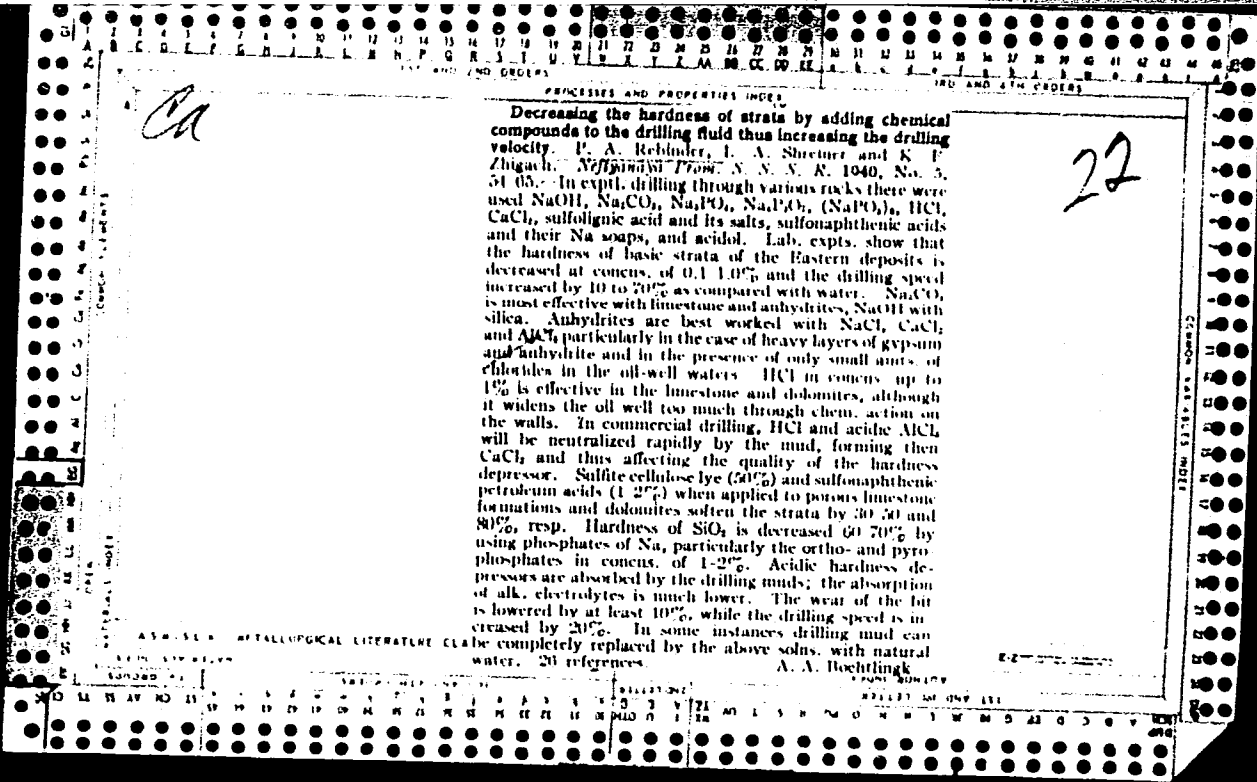
3RD LETTERS

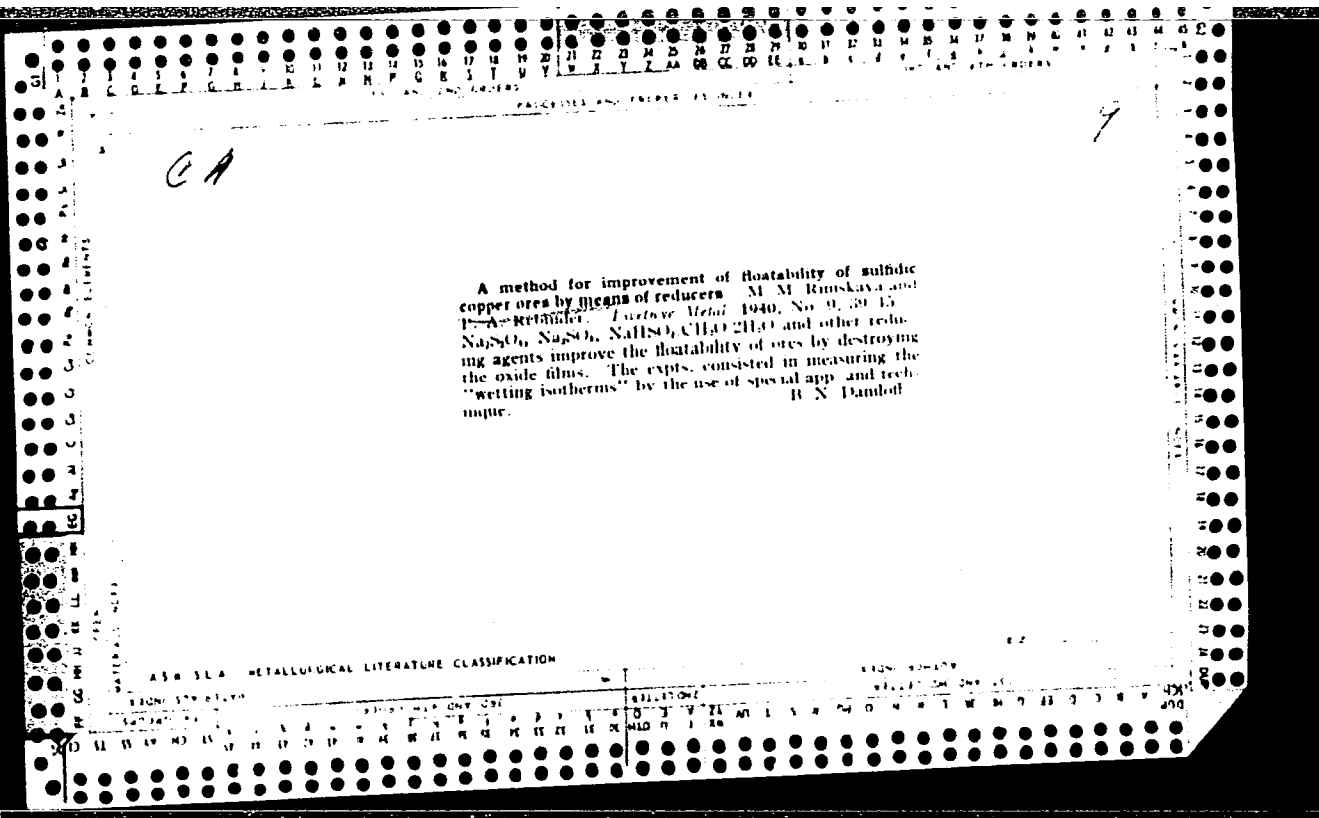
REBINDER, P. A.

Stalin Second Prize of 100,00 Rubles, 1941

Petr Aleksandrovich Rebinder, corresponding member, Academy of Sciences U.S.R.; for the scientific works, Znachenie fizikokhimicheskikh protsessov pri mekhanicheskom razrushenii i obrabotke tverdykh tel v tekhnike (The Significance of Physico-chemical Processes in Mechanical Disintegration and Machining of Solids in Technology), published at the end of 1940, and Oblegchenie deformatsii metallicheskih monokristallov pod vliyaniye adsorptsii poverkhnostno-aktivnykh veshchestv (The Alleviation of Deformation of Metallic Monocrystals under the Influence of Adsorption by Surface-active Agents), published in 1941.

SO: Summary 62, 20 June 1952.





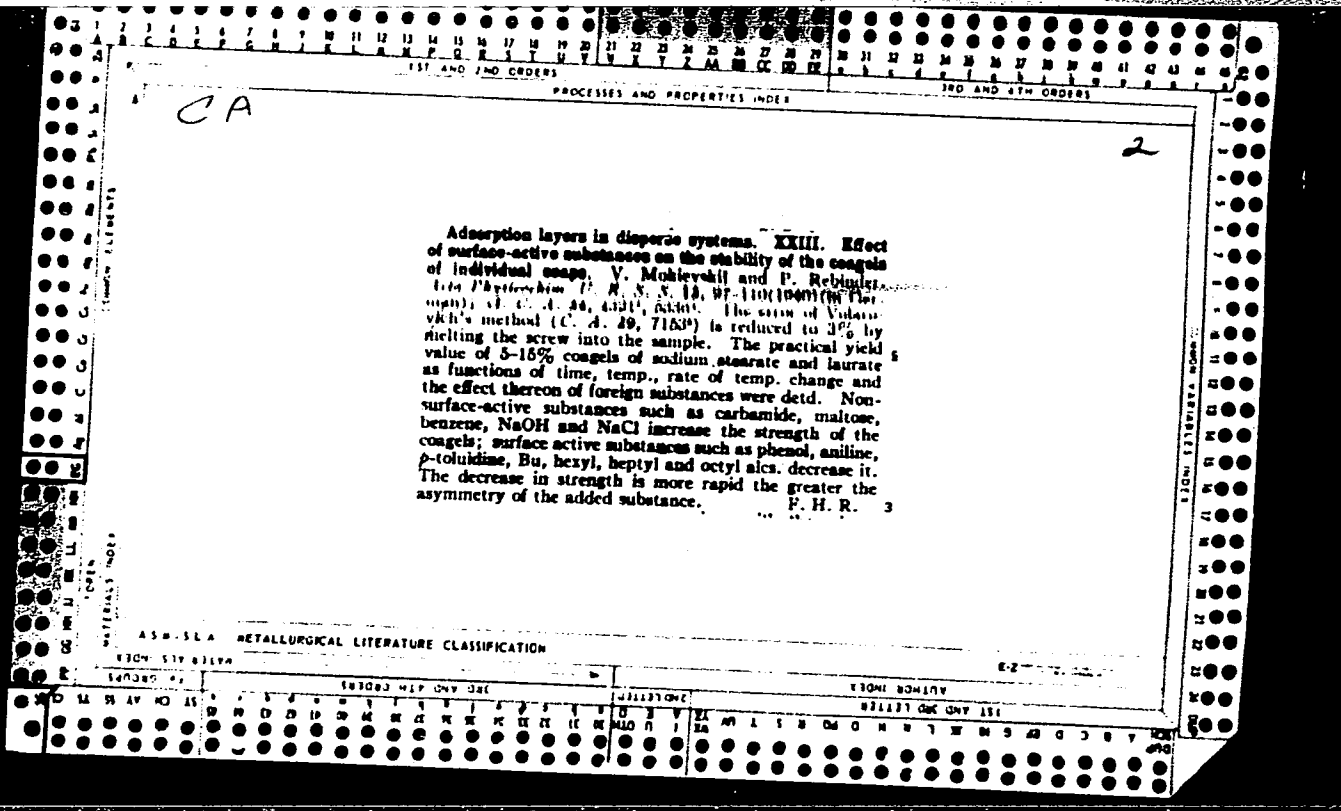
REBINDER, P. A.

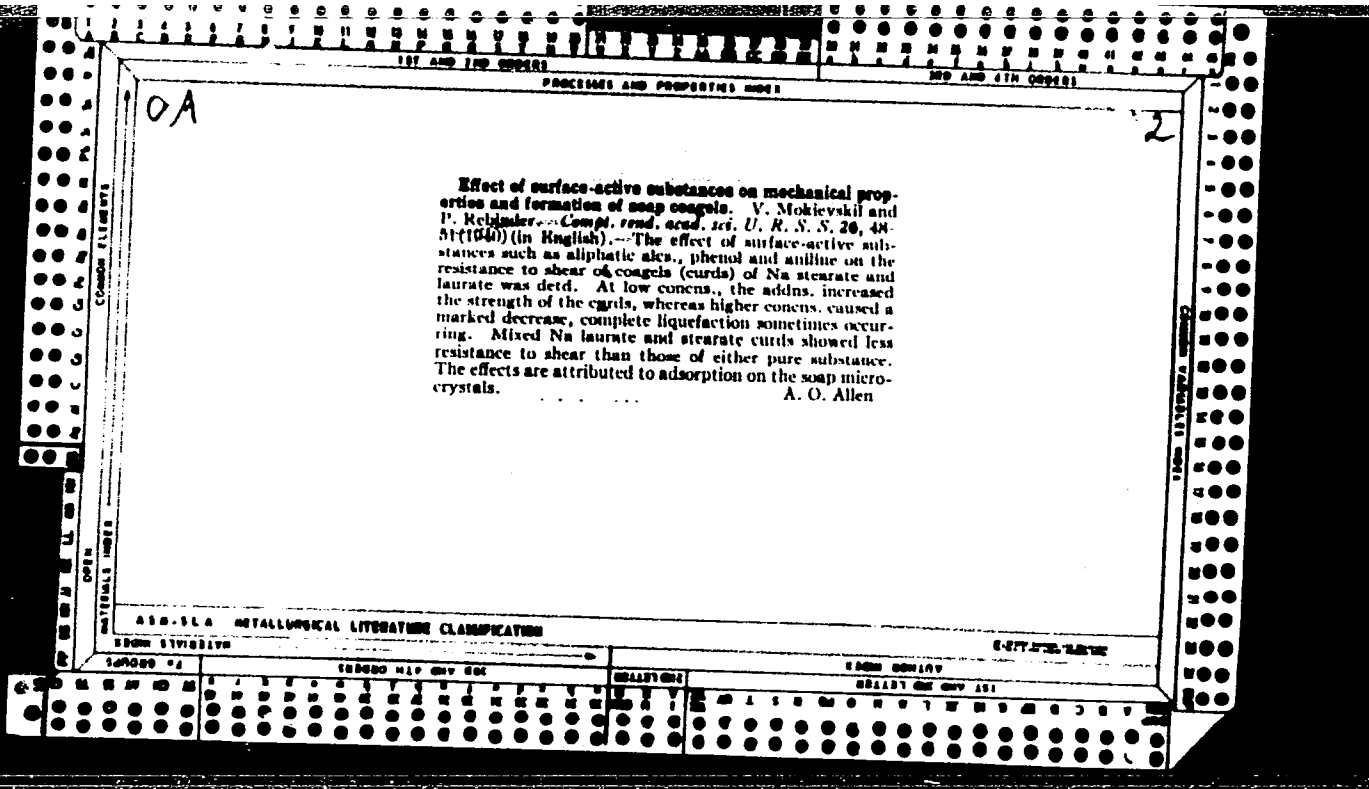
"Adhesive," Yu. L. Margolina, P. A. Rebinder, Pat 58,138(USSR), 31 Oct. 1940. (SEE: Inst. Insect/Fungi. in Ya. V. Samoylov)

SO: U-237/49, 8 April 1949

REMBINDER, .

"Adsorption-Beds in Dispersed Systems." XIII On the Influence of Materials with an
Active Border—Contact on the Durability of the Coagulation of Individual Deposits.
Acta Phys Vol. XIII No. 1, 1940.
Inst for Colloid and Electrochem of the Acad. Scs. of the USSR Lab. for Phys Chem. of
Disperse systems, Moscow.





ca

22

Surface phenomena in petroleum-filtration processes
 M. M. Kusakov, P. A. Rehniger and K. E. Zinchenko
Compt. rend. acad. sci. URSS 28, 1317 (1960); in English

The filtration of petroleum across rock strata was examined by means of a simplified exper. model. The rate of filtration across a layer of quartz powder was found as a function of pressure difference and size of the quartz particles. The expts. included: (1) the filtration through dry quartz of water, of a nonpolar liquid isoviscous with given petroleum, and of the petroleum itself; (2) the filtration through quartz, wetted previously with water, of a nonpolar liquid, of a mixt. of the liquid and the petroleum, and of the petroleum; (3) the filtration of water through quartz wetted previously with a nonpolar liquid or with a mixt. of this liquid and the pure petroleum, or with the pure petroleum. The rate of filtration through dry quartz was smallest for the petroleum, owing to its polar surface-active components. The rate of filtration for water through quartz previously wetted with a hydrocarbon liquid increased as the polarity of the substances in the liquid were reduced. However, the rate of filtration for hydrocarbon liquids through quartz previously wetted with water increased as the polarity of these liquids increased. The results were discussed and interpreted on the basis of adsorption-solvated layers on the quartz surface through the formation of colloids of considerable thickness.

Joseph Kave

*Lab. Petroleum
 Res.; Inst.
 Combustibles
 Minerals;
 Cas. Mex., Acad.
 Sci., 1940*

1ST AND 2ND COLUMNS

PROGRAMS AND PROPERTIES INDEX

3RD AND 4TH COLUMNS

5

2

Effect of adsorbed substances—hardness (or strength) reducers—on the mechanical strength of quartz sediments in water. P. A. Rehinder and Va. B. Aron. *Compt. rend. acad. sci.-U.S.S.R.* 20, 802-6 (1940).—The adsorption of certain electrolytes by rock surfaces greatly reduces their hardness, and facilitates drilling. This phenomenon was investigated by finding the mech. strength of suspensions of the rock in H₂O, or a soln. of an electrolyte, after compression around a threaded Al rod, by centrifuging. The max. stress necessary to tear the rod from the sediment was detd. There is a very marked decrease in the strength of the sediment when very small quantities of hardness reducers (NaCl, MgCl₂, AlCl₃) are added to the H₂O in which a pure quartz sediment is formed. The decrease is the more effective the greater is the valency of the cation. Sucrose also causes a decrease in strength. The theory is that adsorption decreases the cohesion between particles. The thickest liquid film between grains, and hence the greatest loosening of sediment, occurs when there is the smallest coagulation effect, and thus the process is related to peptization. Further increase in the concn. of electrolyte leads to a decrease in the thickness of the adsorbed film, with consequent increase in strength. B. C. P. A.

Inst. Colloids - Electrochemistry; Lab. Physical Chem. of Disperse Systems; Cor. Xbu, O.S. 9/9/40

ASB-S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

6-2

COMPONENTS

OPEN

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

A.C.

Geology

Contributions to the theory of the basic properties of
clay solutions used in oil drilling and the structure forma-
tion in these solutions. P. A. REMINDEN, N. N. SERE-
BININA, AND S. A. NIKITINA. *Nauka i Tekhnika. Raboty*
Khim. Inst. i Lab. Akad. Nauk S.S.S.R. za 1940, 1941, pp.
127-28; Khim. Referat. Zhur., 4 (9) 23 (1941). M.Ho.

CA

PROCESSES AND PROPERTIES INDEX

2

"Viscosity of disperse systems and structure formation.
P. A. Rebinder, *Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, Inst. Mashinovedeniya, Sovetskaya Vysshaya Zhi-dkostel i Kolloid Rashtorov* (Conf. on Viscosity of Liquids and Colloidal Solns.) 1, 361-80(1941).—Crit. review, particularly of Russian work. 26 literature references.
N. Thou

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

LIST AND LETTERS

LIST AND LETTERS

LIST AND LETTERS

LIST AND LETTERS

PROPERTIES AND PROPERTIES INDEX

A-1

BC

Changes in the elastic properties of mica caused by penetration of liquid into the cleavage crystal. P. Rubinsker and G. Logginov (Compt. rend. Acad. Sci. U.R.S.S. 1961: 20: 691-693).—Decrease of strength of a solid placed in a liquid is due to the active liquid (usually the solution of the substance) penetrating inside the crystal into the predestruction zone, i.e., the zone where a gradual formation of micro-cracks precedes fracture. Experiments have been made with mica to investigate the influence of the medium and of adsorbed substances on the elastic deformation of a crystal, and to find out whether the predestruction zone could form in the elastic region. Young's modulus and the strength of the mica in H₂O decrease when iso-C₁₁H₂₃OH is added to the H₂O. The strength of the mica decreases inversely as the concn. of the surface-active substance in the solution, but the elastic deformation with const. stress increases with adsorption according to Langmuir's isotherm. Fully elastic deformations increase considerably (20-25%) under the same additional stresses when H₂O is substituted for aq. solutions of surface-active substances. This has been proved for pure adsorption of saturated alcohols which do not react with the mica; the effect increases regularly on passing up a series of homologues. It has also been proved for exchange adsorption brought about by NaOH. Even though the deformation disappeared when the additional stresses reaction, the deformation disappeared when the additional stresses were removed. The greatest deformation in an active liquid is reached gradually, from which it may be inferred that the liquid penetrates into the crystal through the micro-cracks of the predestruction zone.

Cor. Mbr. Acad.
 Sci.; Inst.
 Colloid and
 Electrochem.
 State U. and
 Inst. Med.
 Voronezh.
 A. J. M.
 1961-

ASD-51A METALLURGICAL LITERATURE CLASSIFICATION

GROUP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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21. 161

Structure development in rubber sols under the action of active fillers. P. Rebinder, G. A. Ab, and S. J. Veller (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **21**, 444-447).—In presence of active SiO_2 sols of Na-butadiene rubber (10-11% in PhMe) develop a continuous structure. Even with $[\text{SiO}_2] = 0.76\%$ there is an appreciable increase in yield val. and anomalous γ . Inactive fillers (ground CaCO_3 , marshmallite, orthoclase) have no structure-forming properties. It is possible that besides transferring the rubber into the film-like state of solvate films, active filler particles act as centres for continuous structure formation by orienting polymer chains under the action of the adsorption field of the particles. Presence of H_2O in the SiO_2 inhibits structure formation. Structure formation also occurs in sols prepared in light petroleum and CHCl_3 . C. R. H.

1. V. I.

Al-1, crystal structure

Deformation of single-crystals of metals facilitated by adsorption of surface-active substances. P. Rebinder, V. I. Lichtman, and V. E. Maslennikov (Compt. rend. Acad. Sci. U. S. S. R., 1941, 31, 125-129).--Sn and Zn monocrystals show the same decrease of yield-point stress on immersion in surface-active solutions, e.g., oleic acid in paraffin oil, as polycrystals. The effect is due to penetration of the surface-active substance along micro-cracks, and leads to a decrease in electrical conductivity in active media. L. J. J.

41-20, Moscow, Oct 1941

Effect of glide-plane orientation in single-crystals of tin on their adsorption-promoted deformation. V. I. Lichman and P. Rabinder (*Compt. rend. Acad. Sci. U.R.S.S.*, 1941, **22**, 130-131). The increase in plasticity of Sn monocrystals (cf. preceding abstract) due to adsorption of oleic acid is max. when the orientation of glide planes to the crystal axis is 40°.

Peculiarities of the process of plastic deformation in gypsum crystals. E. Vamshteyn (*Compt. rend. Acad. Sci. U.R.S.S.*, 1942, [1]).

*Lab. Physical Chem.; K. Liebknecht Pedagog. Inst.
Moscow; State Univ. Saratov; Cor. Mem. Acad.
Sci., 1941.*

Spontaneously forming emulsions. Mechanism of formation of soluble oils. Adsorption layers in disperse systems. K. Pospelova and P. Rehbinder (*Acta Physicochim. U.R.S.S.*, 1942, 16, 71-87). Systems consisting of Na oleate or a naphthene soap, a mineral oil and a soap of a sulphonated castor oil are studied, and regions of stability for emulsions and sol oils are plotted. Dispersity data are also recorded and discussed. Sol oils are systems containing hydrocarbon sufficient only to build up a firmly-bound "super-structure" of mols on the soap micelles; emulsions contain a larger quantity of hydrocarbon, the excess being held to the micelles by weak wetting forces. Transformation of a mineral oil-soap mixture into an emulsion occurs by a phase inversion process at a crit. [H₂O]. When an emulsion is diluted with H₂O the excess oil mols. become detached from the micelles and coalesce to droplets, the sol oil formed simultaneously acting as an emulsifier. A. J. E. W.

*Lab. of Phys. Chem. of the Liebknecht Pedagogical
State Inst., Moscow.*

REBINDER, P. A.

a50/2480 (Hardness reducers in drilling. A physicochemical method of facilitating the mechanical destruction of rocks during drilling)
PONIZITELI TVERDOSTI V BURENII. FIZIKO-KHIMICHESKII METOD OBLEGCHEENIIA MEKHANICHESKOGO
RAZRUSHENIIA TVERDYKH GORNYKH POROD PRI BURENII, Moscow-Leningrad, 1944. 199 pages

ABRIN ER, A.

Laboratory of Disperse Systems, Colloids-Electrochemical Institute, Academy of Sciences, USSR (-1943-)

"Physical-Chemical Analysis of French Chalk as a Buffing-Polishing Material." Iz. Ak. Nauk. SSSR. Otdel. Tekh. Nauk. No. 12, 1944.

BR-52059019

1ST AND 2ND ORDERS

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CA

22

Anomalous viscosity of lubricants at low temperatures. Structure-mechanical properties. P. A. Rebnuker, N. A. Boguslavskaya, and V. B. Moktevskii. *Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, Inst. Mashinostroyeniya, Sveshchaniye po Vysokosti Zhidkosti i Kollod. Rastvorov (Conf. on Viscosity of Liquids and Colloidal Solns.)* 2, 173-7 (1944); *Petroleum (London)* 9, 11 (1946). The effect of surface-active additives on the limiting yield value θ , expressed in g./sq. cm., was studied with a "model oil" consisting of a soln. of paraffin wax in purified mineral oil. Tetraacetyl-ammonium iodide and stearates of multivalent metals such as of Al, Th, and Mn were more effective than Parafflow. Small addns. of stearates lowered the value of θ ; larger amounts reversed this tendency. A simple explanation, based on the presence of 3-4 side-chains with a polar group, is given for both the decrease and the increase. Richard Wiebe

COMMON ELEMENTS

MATERIALS INDEX

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

COMMON ELEMENTS

MATERIALS INDEX

(1) AND THE OTHER PROCESSES AND PROPERTIES INDEX

2

CA

Electrocapillary effects in the reduction of the rigidity and hardness of metals. P. A. Rebiner and Eugenie K. Venstrom. *Acta Physicochim. U.R.S.S.* 16, 38-50 (1944) (in French); cf. *C.A.* 37, 293, 812. — The mech. properties of solids of various types (e.g., pyrite or Fe) in contact with an electrolyte soln. vary with the difference in potential at the crystal-electrolyte interface. The curve of hardness or extensibility vs. potential is parabolic and is analogous to the electrocapillary curve for the free energy of the interface Hg-electrolyte. The max. values of the hardness and of the tension corresponding to equal elongations are obtained when the surface is not charged. A charge, either pos. or neg., applied by attaching a cell to the electrolyte, decreases the hardness in the deformed region; this decrease corresponds to the decrease in surface tension in electrocapillary expts. Addns. of org. surface-active agents (e.g., octyl alc., nonyllic acid) vary the form of the charge-vs. resistance to deformation curves in a way exactly analogous to their effect on the electrocapillary curve of Hg. A decided reduction in hardness results when adsorption takes place on uncharged surfaces; this effect disappears for high values of the charge, presumably because adsorption is minimized or impossible under these conditions. The results are interpreted by means of the concept of microfissures, in part embryonic, that develop as a result of the deformation of the solid. The reversible formation of such microfissures, which disappear spontaneously after the adsorbed charge is removed from the surface, is the primary cause of the reduction in hardness produced by adsorption; the adsorbed mols. penetrate into the fissures under the action of their surface pressure. The observed electrocapillary effects are due to the formation of ionic double layers on the internal surfaces of the fissures near the orifices. The variation of the hardness of pyrite with the concn. of NaCl, at const. applied surface polarization, corresponds to the results found previously for rocks and nonmetallic minerals. The form of these curves for pyrite shows the importance of the thickness of the diffuse part of the double layer and of its decrease with the concn. of electrolyte in the microfissures. The electrocapillary effect in deformability can be used as the basis for a new method of detg. the electrocapillary curves of solid metals.

T. H. Dunkelberger

*A S, USSR
Inst. of Colloidal & Electro-Chem.,
Lab. of Surface Systems*

ASS-514 METALLURGICAL LITERATURE CLASSIFICATION

123000 1117 01V 01K

123000 1117 01V 01K

123000 1117 01V 01K

PROCESSES AND PROPERTIES INDEX

1

CA

The elastic-plastic properties and the thixotropy of disperse systems. S. Ya. Veller and P. A. Melniker. *Compt. rend. acad. sci. U.R.S.S.* 49, 345-8(1945)(in English).—The elastic properties of thixotropic suspensions and colloidal sols. can be investigated by means of an app. consisting of a thin plate of mica attached to a glass thread that is suspended from a quartz spring, a vessel contg. the liquid to be investigated, and a motor for continually lowering the vessel at a const. speed of 3.3 μ /sec. The mica plate is immersed in the suspension and the extension of the spring at any given displacement of the plate is read with a microscope. The ultimate shearing stress is independent of the dimensions of the plate and shape of the vessel. Advantages of the app. are sensitivity, ease of temp. control, and broad range of consistencies that can be investigated. The kinetics of thixotropic gelation of a clay suspension was studied by detg. the ultimate shearing stress at varying times, starting with a suspension in which all thixotropy had been destroyed.
H. K. Livingston

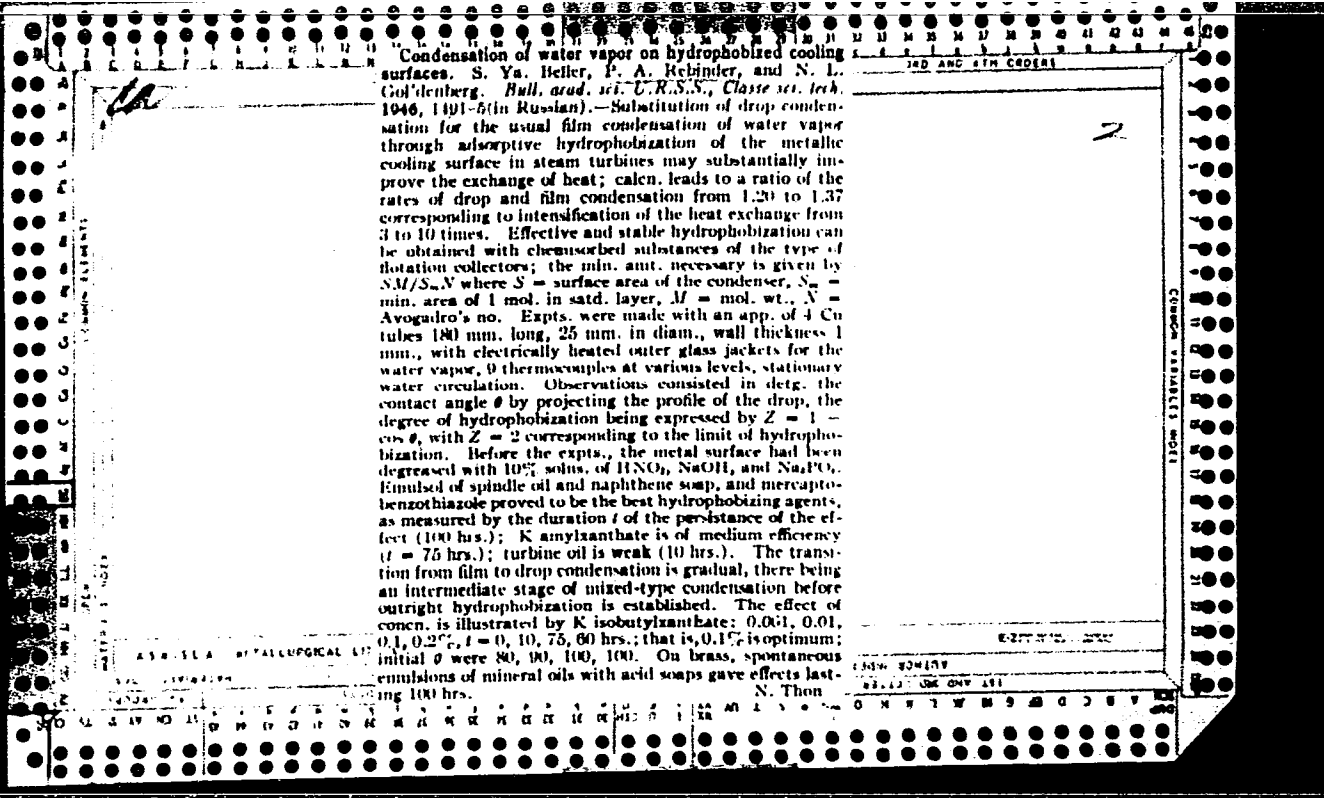
Unst. Colloid Electrochem.; Can. Miner. Resch. Sci., 1945-

ASS. S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

REGION DIVISION

SUBJECT

SUBJECT ONE ONE 101



Physicochemical investigation of the cooling ability of liquids in cutting metals. W. A. Pieteneva and P. A. Rebinder. *Bull. acad. sci. U.R.S.S., Classe sci. tech.* 1946, 1823-9 (in Russian).—Cylindrical steel samples 30 cm. long, diam. 1 cm., were placed in an elec. furnace with one end (machined flat) protruding; the liquid investigated was allowed to drip at a known rate V (3.5, 7.0, and 16.7 cc./min.) on the flat end and the temp. t of the bar, right behind the drop-cooled flattened end, was measured with a thermocouple as a function of time τ , for various initial temps. t_0 of the rod, 470, 434, and 356°; a stationary const.-temp. state was reached in 4-5 min. On cooling with water, t falls sharply within the first 60-100 sec.; 1% electrolyte solns. (Na_2CO_3 , $\text{Na}_2\text{B}_4\text{O}_7$) show no difference from pure water. However, 0.2 and 1.0% Na oleate solns. show an entirely different behavior. At $V = 3.5$, $t_0 = 470$ and 434°, the liquid does not wet the metal at all, consequently, cooling can only proceed through a vapor layer and is extremely slow; the $t-\tau$ curve is nearly horizontal. For $t_0 = 350^\circ$, the same effect prevails during the first 100 sec.; as soon as $t = 350^\circ$, the spheroidal envelope is broken and cooling becomes suddenly as fast as it was with pure water in the initial stages. From $t_0 = 470^\circ$, $V = 4.3$, a 0.01% Na oleate soln. cools more slowly than water during the first 170 sec., down to 340° where the 2 curves intersect, after which the cooling rate becomes faster with the 0.01% Na oleate than with water; the latter effect is due to better wetting. In terms of V , from $t_0 = 470^\circ$, 0.2% Na oleate has no cooling effect at $V = 3.5$ but does cool the metal

at 7.0 cc./min. and even faster at 16.7, while pure water cools at any V , at about the same rate for $V = 7$ and 16.7; the 1% Na oleate soln. exerts a cooling effect only at 16.7 cc./min., none at a slower rate of dripping; in other words, the spheroidal condition is only disturbed at least $V = 7$ and 16.7 cc./min., for the 0.2 and the 1% Na oleate, resp. From any of the 3 t_0 , solar oil cooled somewhat faster at $V = 15$ than at 5 cc./min. but still more slowly than water at 4.3 cc./min.; there is no indication of a spheroidal state at the given (too low) t . The practical conclusion is that when a surface-active soln. is used for cooling in metal cutting, to ensure better wetting, the rate of feeding must be sufficiently high to prevent establishment of a spheroidal envelope. Curves show the dependence of the rate of cooling on time and on the rate of flow of cooling liquid. It is noteworthy that water is most effective as cooling liquid in the very first stages of its contact with the metal while 0.2 and 1% Na oleate have only a significant and comparably rapid effect at sufficiently high feeding rates.

N. Thom

A 5 B 5 L A METALLURGICAL LITERATURE CLASSIFICATION

REBINDER, F. A.

Inst. Physical Chem., Acad. Sci. USSR, (-1946-)

"Colloid Suspension of Clay in Water as Lubricating and Cooling Liquids in the Deep Drawing of Metals," Iz. Ak. Nauk, Otdel Tekh. Nauk, Nol 4, 1946.

USSR - Moscow, U. S. S. R.

Dec 1946

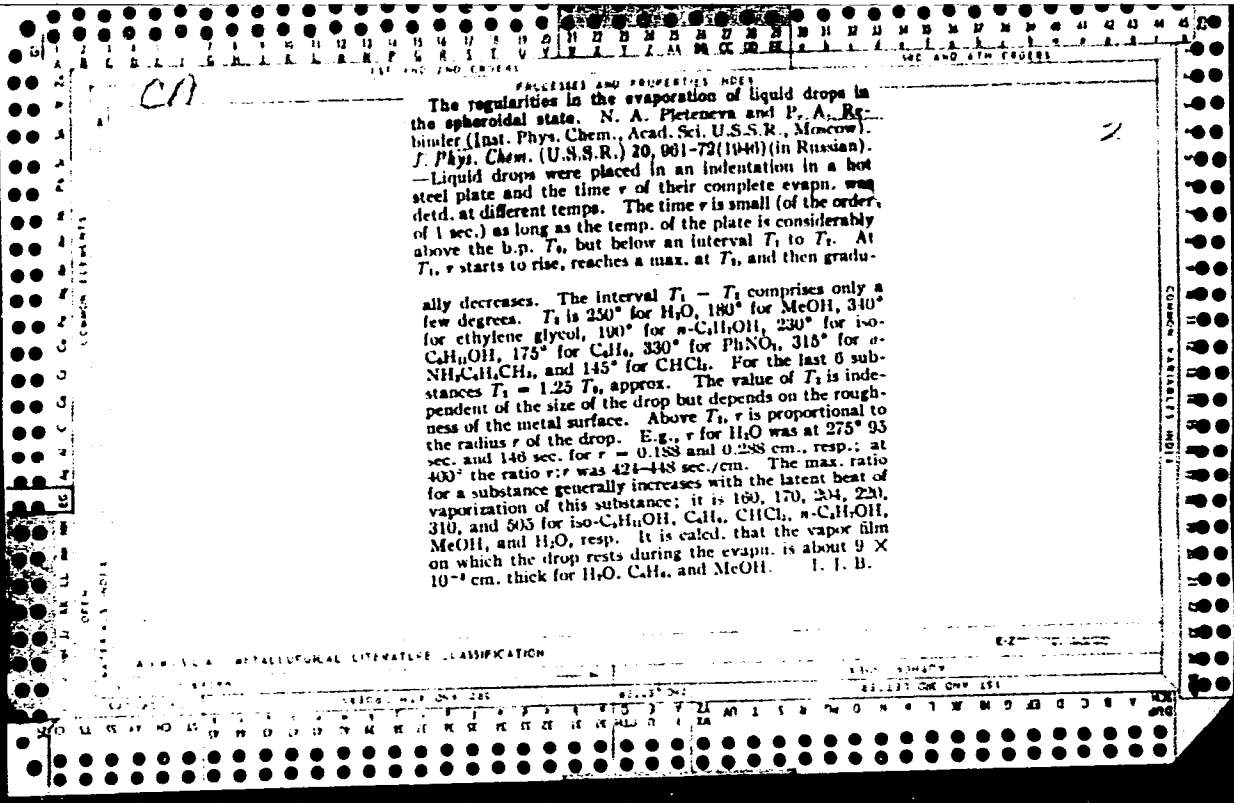
USSR/Cutting Fluids
Metals - Cutting

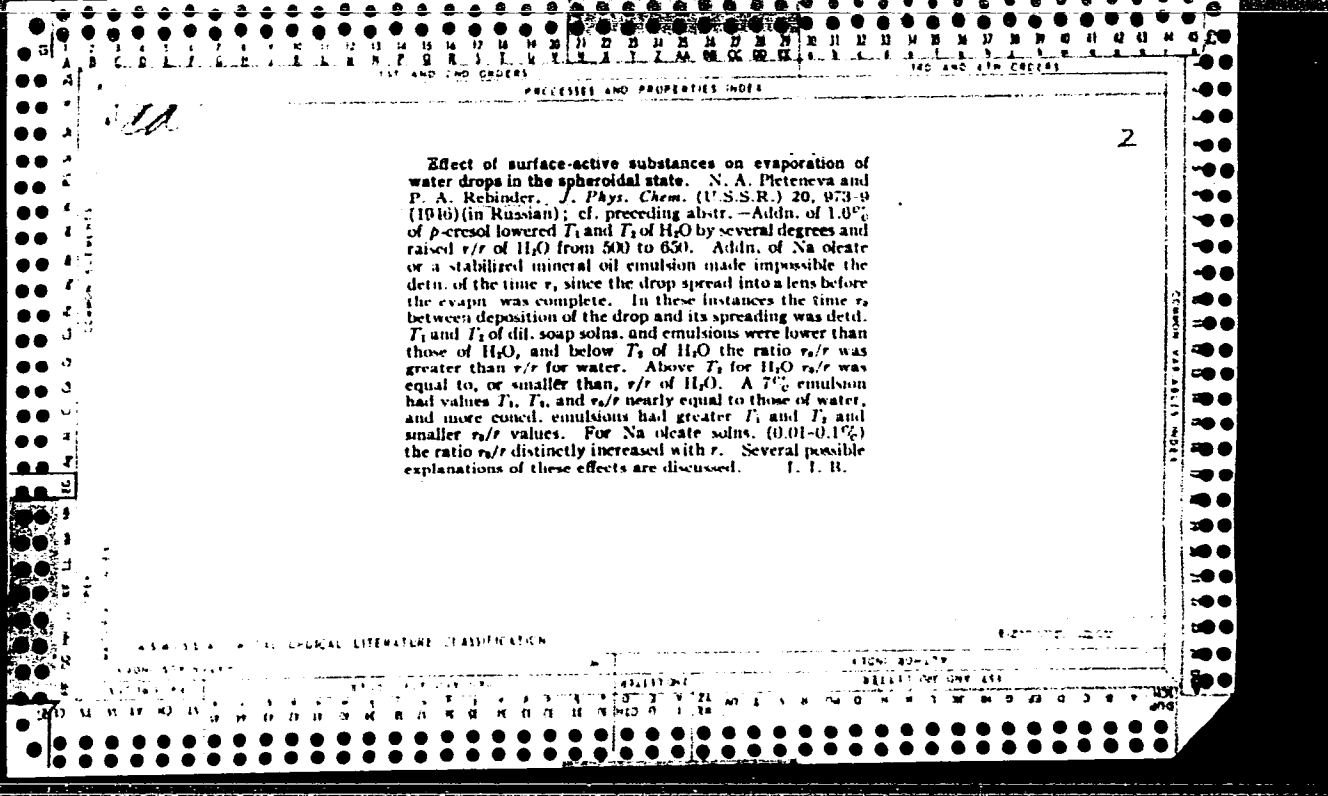
"Physical-Chemical Investigation of the Cooling Properties of Liquids in the Cutting of Metals," K. A. Fleteneva, P. A. Ashbinder, 7 p

"Izv Ak Nauk Otd Tekh" No 12

discusses, with accompanying illustrative graph, the relative values of various liquids for use as cooling agents in the cutting of metals. Among the conclusions is the fact that there is an increased stability of temperature when there is a cover of vapor around the metal.

PA 2445





Effect of surface-active substances on evaporation of water drops in the spheroidal state. N. A. Pieteneva and P. A. Rebinder. *J. Phys. Chem. (U.S.S.R.)* 20, 973-9 (1946) (in Russian); cf. preceding abstr. —Addn. of 1.0% of *p*-cresol lowered T_1 and T_2 of H_2O by several degrees and raised v/r of H_2O from 500 to 650. Addn. of Na oleate or a stabilized mineral oil emulsion made impossible the detn. of the time τ , since the drop spread into a lens before the evapn. was complete. In these instances the time τ_2 between deposition of the drop and its spreading was detd. T_1 and T_2 of dil. soap solns. and emulsions were lower than those of H_2O , and below T_2 of H_2O the ratio v_2/r was greater than v/r for water. Above T_2 for H_2O v_2/r was equal to, or smaller than, v/r of H_2O . A 7% emulsion had values T_1 , T_2 , and v_2/r nearly equal to those of water, and more concd. emulsions had greater T_1 and T_2 and smaller v_2/r values. For Na oleate solns. (0.01-0.1%) the ratio v_2/r distinctly increased with τ . Several possible explanations of these effects are discussed. I. I. B.

CA

2

Relations governing the evaporation of liquids in the spheroidal state. I. N. A. Pleteneva and E. A. Rehbinder. *Acta Physicochim. U.R.S.S.* 21, 961-77 (1946) [in English]. Some relations governing the evapn. of pure liquids of different polarities in the spheroidal state were investigated with the object of elucidating the physicochem. fundamentals underlying the cooling effect of the liquids used in metal working. The spheroidal state is treated as the state of a system in which the bulk of the cooling liquid is sepl. from the heated metal surface by a spontaneously formed film of satd. vapor which precludes direct contact between the metal and the liquid and thus sharply retards heat transfer. The relation of the time for complete evapn. of a liquid drop on a metal surface heated to a const. temp. throughout the process of evapn. was observed over a wide range of temps., and a general form of this relation was established and found to be the same for a large variety of liquids. This factor resulted in the discovery of a special point - the temp. at which the spheroidal state is first reached; this temp. is characteristic of a given liquid provided a standard metal surface of a const. degree of roughness is used. For pure liquids, the ratio of this temp., T_s , to the b.p., T_b , is 1.25 for nonpolar and slightly polar liquids, whereas for liquids of a higher polarity it rises to 1.3-1.4. Hence, the

spheroidal state is attained on reaching a certain vapor pressure - about 10 atm. for liquids of the first group and 20-35 atm. for those of the second. An analysis of the dependence of the time, τ , for complete evapn. of drops of different radii upon the temp., t , of the heated metal surface shows the invariance of the function $\tau R = f(t)$, i.e., its independency of R for sufficiently small, practically spherical drops at $t \geq t_s$. The invariance of the function τR amounts to the constancy of the rate of evapn. throughout the process of evapn. of a drop. This invariance was experimentally confirmed for water and benzene, i.e., liquids of widely differing surface tensions. The curves $\tau R = f(t)$ exhibit a sharp max. near the temp. at which the spheroidal state is reached. The height of this max. is mainly detd. by the value of the latent heat of evapn. near the normal b.p. Approx. computations of the thickness, δ , of the vapor coating around a drop in the spheroidal state for 3 liquids of greatly differing b.p.s. and polarities (water, MeOH, and benzene) show that the temp. at which this state is reached corresponds to a const. value of δ , about 90 μ . Jacquelyn Finlay

AS 4 31 A METALLURGICAL LITERATURE CLASSIFICATION

RECORD NUMBER

PROCESSES AND PROPERTIES INDEX

Structure development in sols of polyvinyl chloride resins under the influence of SiO₂ as active filler. Ya. D. Aron and P. A. Rebindler. *Compt. rend. acad. sci. U.R.S.S.* 52, 215-218 (1955); cf. C.I. 37, 1057. The effect of active SiO₂ on the ultimate static shearing stress of initially structureless sols of 0.6% polyvinyl chloride in PhCl was studied at 1.9 to 9.0 vol. % of filler, the measurements being made with the elastometer-shearimeter of Veller and Rebindler (C.I. 40, 594). The increment of the ultimate shearing stress in the polyvinyl chloride sol above its value for the same filler suspension in pure PhCl increased linearly with the vol. % of filler. The ultimate shearing stress of the polyvinyl chloride sol was increased 12 times when the filler was increased from 4.9 to 7.1 vol. %. The critical concentration of the dispersion at which a structure appeared decreased as the dispersion of the filler increased. In pure PhCl the SiO₂ filler settled at the rate of 0.03 cm. per hour and had an ultimate vol. of 5.3 cc. g., the respective values for the sol were 0.12 cm. per hour and 6.5 cc. g. The particles of active filler act as centers for the formation of a continuous space structure which owes its existence to the orientation of the polymer chains at the surface of the filler particles. Weldon N. Baker

31

Inst. Phys. Chem.; Research Inst. General
Exptl. Plastic Factory, Moscow, U.S.S.R. 1946

ASB-35A METALLURGICAL LITERATURE CLASSIFICATION

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

1ST AND 2ND COORDS PROCESSES AND PROPERTIES INDEX

2

ca

A new method of investigation of the stability of two-sided liquid films. A. M. Smirnova and P. A. Rehbinder. *Compt. rend. acad. sci. U.R.S.S.* 52, 317-19(1948); *CF. C.A.* 32, 6125'.—An app. for the dynamic measurement of the stability of films is described. The rate of film stretching can be controlled, and the lifetime and length of the film before rupture can be detd. Into one of 2 communicating cylindrical glass tubes, 2 vertical, parallel Pt wires are sealed in the top and bottom. They are connected by a horizontal Pt wire at the center. An inert, dust-free gas enters through a 4-way stopcock into either tube and leaves through a trap and rate-controlling rheometer. The liquid (or liquids) is introduced through a ground-glass joint. The film forms at the cross wire as the interface moves past it due to the gas pressure; the breaking length varies with the stretching velocity, and rupture usually occurs near the cross arm. For a water-paraffin oil oleic acid system the film life was 2.0-2.3 sec. with 0.01% oleic acid and stretching rates of 2.4-21.0 mm./sec., and 1.15-1.3 sec. with 0.07% oleic acid and rate 6.0-15.5 mm./sec. Reproducibility for aq. alcohol films in gas was equally good, but the life decreased with increasing stretching velocity. In the first case the effective film thickness was const., in the 2nd its spontaneous and local decrease varied with stretching velocity. B. M. C.

ASB SIA METALLURGICAL LITERATURE CLASSIFICATION

GROUP	SUBGROUP	CLASSIFICATION	INDEX

1ST AND 2ND ORDERS PROCESSES AND PROPERTIES INDEX

8

Colloid-chemical nature of cohesion in argillaceous rocks. N. Ya. Denisov and P. A. Rehbinder. *Compt. rend. acad. sci. U.R.S.S.* 54, 519-22(1940) (in English). Mol. attraction and the gluing or cementing action of fine colloidal silicate films cannot, alone, explain fully the cohesion of argillaceous rocks. Phys.-chem. processes occurring at boundaries of solid and liquid phases are factors of prime importance. Formation of colloidal films on particle surfaces results from peptization of hydrophilic argillaceous material (interaction of H₂O with chem. constituents of surface layers of the particles). The surface soil developed can form a gel, even if the H₂O content is high, because the clay particles cling together with their less hydrophilic ends to form a skeletal framework. Colloidal films can secure or restore cohesion only within a definite range of moisture content, between the shrinkage limit and liquid limit. Where hydration is greater than that at the shrinkage limit, compression of the rock develops greater cohesive strength. Where hydration is below the shrinkage limit, compression completely destroys the bonds between the rock particles and weakens the cohesion. Increase in moisture content of the colloidal film (film of the gel) results in decreased cohesion and increased plasticity. The loss of plasticity by argillaceous rocks and their rigidity in nature are due to dehydration of colloidal films; this makes the particle surfaces inaccessible to moisture. Sediments of clay powder are denser in nonpolar liquids like gasoline than in H₂O, but weaker mechanically, and exhibit no thixotropy. In H₂O, they do form thixotropic structures, the colloidal films that arise (peptization) contributing to this process. The structures show sharp decrease of strength under mech. stress, but are spontaneously restored if there is sufficient moisture. Consolidation and formation of structure in sediments result from the specific mol. forces of interaction, the intensity of which varies widely with conditions of sedimentation and moisture. Particles of an argillaceous rock are not all hydrophilic in the same degree. Thus, the structures formed in nature will show variations in d. and mech. strength for the same compn. Colloidal films may also act as lubricants; this allows particles to move freely and develop extremely dense packing under pressure. The binding effect of colloidal films may be accompanied by the cementing effect of various inorg. and org. substances (CaCO₃, CaSO₄). The solv. of these cements det. the accessibility of H₂O mol. to particle surfaces, and indirectly, the degree of possible colloidal activity. E. W. C.

Ki. Research Inst
Vodges, Dept. of Descriptive
Systems) Inst. Phys.
Chem., Cas. Mks. Acad.
Sci. 1946

ASTM A14 METALLURGICAL LITERATURE CLASSIFICATION

REBINDER, P. A.

USSR/Chemistry - Emulsions
Chemistry - Phases

Jan 1947

PA 3476
"A Study of the Process of the Reversion of Phases in Emulsions," P. A. Rebinder, G. A. Ab, N. I. Gol'denberg, Section for Dispersed Systems, Institute of Physical Chemistry, Academy of Sciences of the USSR, 6 pp

"Kolloidnyy Zhurnal" Vol IX, No 1

The study of self-formed particulars of the process of reversion of phases in emulsions, i.e., the transformation of a emulsion of one type, e.g., a reverse emulsion of water in oil (W/O), into a direct emulsion of the type (O/W) or oil in water. Data ob-

LC

3476

USSR/Chemistry - Emulsions (Contd)

Jan 1947

tained was in agreement with the principles expressed by Finkle, Draper, and Hildebrand with regard to the characteristic of soaps-potassium, sodium to emulsify oil in water.

*Reference for Dispersed Systems
Semt. of Physical Chem,
Acad. Sci. USSR, -1947-*

LC

3476

STRUCTURE AND PROPERTIES INDEX

Structure formation in aqueous suspensions of bentonite clays. N. N. Serb-Serbina and P. A. Reblinder. *Kolloid, Zhur.* 9, 381-91(1947).—Thixotropic properties of 3 kinds of domestic clays, I and II of the Na-Ca bentonite type, III characterized by a high carbonate content, and I and II either converted into H^+ -bentonites by treatment with HCl and subsequent removal of Cl^- ions by electro dialysis, or with the H^+ exchanged for Na^+ ions by detd. by viscometry in a capillary plastometer (*Ibid.* 8, 63(1946)) and by tangential displacement of a thin Pt foil in a Veller-Reblinder elastometer (*C.A.* 40, 596^u). In aq. suspension, the structural viscosity of η of the natural bentonites I and II increases with their concn. much faster than in electro dialyzed clays, the latter showing no structure up to 8-10%, whereas in the natural clays structure appears at as low as 3-4%. The limiting shearing stress θ also increases with the concn. Curves of the shearing stress P as a function of strain are of 3 types. For a 10% suspension of I, the slope of the initial ascending portion of the P curve, corresponding to the range of elastic deformation, is independent of the length of the preceding rest period; after passing through a max., P_{max} , corresponding to perturbation of the structure, the curve falls and becomes horizontal, the practically const. P_{min} , corresponding to residual structure, being the higher the longer the preceding rest period. A 2nd type of curve is found with electro dialyzed II after replacement of H^+ by Na^+ ; the slope of the initial rectilinear portion increases somewhat with the length of the rest period, whereas, beyond the elastic range, P first continues to increase, then, after passing through P_{max} , falls off uniformly. Perturbation of the structure actually occurs at a point P_s below P_{max} , the region between those 2 points corresponding to gradual predominance of plastic over elastic deformations. Some electro dialyzed H^+ -bentonites, partially replaced with Na^+ , and also highly concd. suspensions of bentonites in paraffin oil, show a 3rd type of curve, characterized by an initial rise of P going over, without passing through a max., into a horizontal portion. These 3 types of $P(s)$ curves correspond to 3 different mechanisms of structure formation and perturbation, the 1st to brittle rupture, the 2nd to thixotropic structure formation with plastic rupture, the 3rd to plastic flow. The modulus of shear, $E = P/s$, detd. from the initial rectilinear portions, is highest, and const., in the 1st case, and is considerably lower, but increases with the length of the rest period, i.e. with the degree of thixotropic structure stabilization, in the 2nd case. Depending on the treatment, the same clay may exhibit $P(s)$ curves of different types. Thus, if I is repeatedly washed out, brittle rupture disappears and the rupture becomes of the 2nd type (plastic); after electro dialysis and satn. with Na^+ , the curve becomes of the 3rd type. Clay III gives no plastic-flow curve on satn. with Na^+ ; partial replacement with Na^+ results in a curve of the 2nd type. An imported (U. S. A.) bentonite showed brittle rupture of the 1st type, but with a greater velocity of thixotropic recovery.

N. Thon

A 58-51 A METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS PROCESSES AND PROPERTIES INDEX 3RD AND 4TH ORDERS

CA

2

Effect of surface-active substances on the evaporation of water drops in the spheroidal state. II. N. A. Pleteneva and P. A. Rebinde (Acad. Sci., Moscow). *Acta Physicochim. U.R.S.S.* 22, 1-12(1947)(in English). See C.I. 41, 2631c. A. R. P.

Acad. Sci. USSR, 1947.

ASD-SLA METALLURGICAL LITERATURE CLASSIFICATION

1ST AND 2ND ORDERS 3RD AND 4TH ORDERS

REBINDER, P. A.

PA 60771

USSR/Metals
Crystallography
Deformation

Jun 1947

"Regularities in the Deformation of Metallic Mono-
crystals and the Presence of Surface-Active Mate-
rials," P. A. Rebinder, Academician; V. I. Likht-
man, 4 pp

"Dok Akad Nauk SSSR, Nova Ser" Vol LVI, No 7

Concludes that effects of action of an adsorbent
substance - reduction of limit of flow, and decrease
of coefficient of hardening - show a general rela-
tionship to concentration of oleic acid. Illus-
trated with microphotographs and two graphs.

60771

M

**The Effect of the Rate of Deformation and Temperature on the Magnitude of the Reduction in Strength of Single Crystals of Tin and Lead Due to Adsorption. V. I. Likhman, P. A. Rehbinder, and L. P. Yanova (Doklady Akad. Nauk S.S.S.R., 1947, 56, 827-830; C. Abs., 1950, 64, 8189).—[In Russian]. Cf. preceding abstract. Cylindrical single crystals of very pure Sn and Pb were prepared by Kapitza's method. Sn crystals having an optimum orientation of the slip planes were chosen, but this was not so essential in the case of the Pb crystals. The stress/elongation diagrams were obtained with an apparatus of the Polanyi type. By the use of special apparatus the rate at which the crystals were extended was varied from 0.05 to 1000%/min. The crystals were extended in air, in petroleum oil (non-polar and very pure), and in the latter with the optimum addn. (~0.2%) of the following surface-active substances: oleic acid, palmitic acid, and cetyl alcohol. Measurements were made at 20° and 100° C. The max. adsorption effect for Sn at 20° C. was observed at a rate of 5% elongation/min. The effect disappeared at 0.05 and at 100%/min. At 100° C. the max. effect was observed at 240%/min. The effect disappeared at 10-15 and at 1000%/min. Pb behaved similarly, although it showed no creep limit. In these experiments the effect of raising the temp. was similar to that of reducing the rate of extension. The degree to which the adsorption effect facilitates the deformation (reduces resistance) can therefore be observed only within certain limiting rates of deformation. These limiting values are determined by the temp. at which the extension is carried out.*

CA

2

Elastic after-effect in tin monocrystals subjected to plastic flow. V. I. Likhtman and P. A. Reblinder. *Doklady Akad. Nauk S.S.S.R.* 97, 83-8 (1947). Stretching of wire-shaped Sn monocrystals in liquid petrolatum with or without added 2% oleic acid was followed dynamometrically and conductometrically. After 200% extension and release of the pull the specimen showed for some 1.5 hrs. a tendency toward contraction reaching 0.03% of initial length in liquid petrolatum, or as much as 0.15% in oil with oleic acid (in this case 6-7 hrs. duration was seen). At the same time an increase of cond. takes place reaching 3-4% in inert soln. and 15-20% in the presence of active substances (oleic acid). The "relaxation" phenomenon appears to come from relief of strains caused by slip-plane shifts during the stretching.

G. M. Kosolapoff

PROCESSES AND PROPERTIES INDEX

New Physico-Chemical Phenomena in the Deformation and Mechanical Treatment of Solids. P. Rehbinder Nature, v. 159, June 28, 1947, p. 866-867.

Summarizes report on wartime advances in the U.S.S.R. presented at general meeting of the Academy of Sciences in July 1946. Of special interest are two effects resulting from the penetration of surface active substances into microcracks: retarded elastic deformation in mica crystals and structural changes on plastic deformation of metals.

METALLURGICAL LITERATURE CLASSIFICATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Rebinder, P. A., Schreiner, L. A. and Zhigach, K. F.

"Hardness Reducers in Drilling" by P.A. Rebinder, L. A. Schreiner, K. F. Zhigach, of the Colloids-Electrochemical Institute, AS USSR, published by the AS USSR, Moscow 1944, translated from the original by the Council for Scientific and Industrial Research, Melbourne Australia 1948, 163 pages.
SO: B-2728, Oct 52

REBINDE . S. A., Professor

"The Surface Phenomenon in the Process of Oil Filtration."
Neftvnoe Khozyaystvo--Aug 48 - Moscow

REBINDER, P. A.

PA 7819

USSR/Chemistry - Colloids, Structure of May/June 1948
Chemistry - Thixotropy

"Research on the Structural and Mechanical Properties
and on Thixotropy in Oleocolloidal Systems," Ye.
Ye. Segalova, P. A. Rebinder, Moscow State U imeni
M. V. Lomonosov, Chair of Colloidal Chem, 17 $\frac{1}{2}$ pp

"Kolloid Zhur" Vol I, No 3

Used method of measuring plastic stability to deter-
mine the qualitative nature of the thixotropy of
calcium stearate systems. Necessary to differentiate
between condensing and dispersion structures. Es-
tablished the effect of small additions of surface-
active ingredients on the stability and thixotropy
of these structures. Submitted 22 Oct 1947.

7819

*Moscow State U. imeni M. V. Lomonosov,
Chair of Colloidal Chem., c1948 -*

REBINDER, P. A.

PA 65/49T6

USSR/Chemistry - Instruments
Metallography

Nov/Dec 48

"A Study of the Structural and Mechanical Properties of Metallic Dispersion Systems by the Conic Plastometer Method," B. Ya. Yampol'skiy, P. A. Rebinder, Moscow Ord of Lenin State University, M. V. Lomonosov, Sci Res Inst of Chem, 9 pp

"Kolloid Zhur" Vol X, No 6

Describes an improved plastometer. Measurements showed a considerable decrease in the minimum tension with a rise of temperature. Concentrated amalgams of many metals proved to be dispersion systems of metallic crystals and their aggregates in a dispersed medium. Measured minimum tensions in lead amalgams with a 32-90% Pb content. Submitted 8 Jun 48.

*Proccedings of the
State U.S.S.R. Acad. Sci. Div. of Chem. - 1948 -*

65/49T6

REBINDER, P. A.

USSR/Engineering
Cutting Fluids
Drilling

Oct 48

"Effect of a Surface-Active Liquid on Cutting and Machining Processes," N. A. Pleteneva, Acad P. A. Rebinder, Sec of Dispersed Systems, Inst Phys Chem, Acad Sci USSR, 4 pp

"Dok Ak Nauk SSSR", Vol LXII, No 4

Discusses previously reported data obtained by authors. Also discusses effect of additives such as cetyl alcohol on nonpolar vaseline oil and of propyl alcohol, heptyl alcohol or cetyl alcohol on kerosene used for drilling aluminum. Indicates the significance of optimum amounts of these additives for most favorable effect on cutting operation. Thus, optimal action of propyl alcohol is obtained at concentration 5 - 6 mol/l, and that of cetyl alcohol or stearic acid at 0.01 mol/l. Submitted 10 Jul 48.

Pa 33/49737

REBINDER, P. A.

USSR/Metals
Aluminum
Cutting

Oct 48

"Increase in the Rigidity of Aluminum Upon Cutting, Depending on the Surface Activity of the Medium," N. A. Ploteneva, L. A. Shragner, Acad P. A. Rebinder, Ser on Dispersed Systems, Inst of Phys Chem, Acad Sci USSR, 2½ pp

"Dokl Ak Nauk SSSR" Vol LXII, No 5

Drilling annealed aluminum increases rigidity of the metal at the point drilled. In an inactive medium, such as kerosene, increase was found to be about 2.5 times as high as in kerosene solutions of stearic acid. With progress of drilling, increase of the rigidity of the metal in contact with nonpolar media became more pronounced, but in the presence of 0.25% palmitic acid in kerosene it did not increase after the first millimeter drilled. Submitted 10 Jul 48.

PA 52/19273

Ca

Increase of the hardening of metals by periodic deformation under the influence of surface-active substances. I. Yu. Lyubimova and P. A. Rebinder. *Doklady Akad. Nauk S.S.S.R.* 63, 159 (1948). Progressive cold-working hardening of the metal (Zn, annealed 2-4 hrs. at 200° to a grain size of 25-300 μ , polished and etched with HNO₃ or HCl, and cast electrolytic Cu, grain size $\approx 50 \mu$) was brought about by the periodic motion, on the surface of the metal, of the 7.54-mm. steel ball (mass of 21 kg., heavy pendulum oscillating with a maintained amplitude, with a period of 1.07 sec.; through its motion, the steel ball produced on the metal an elliptic groove). The same pendulum, allowed to swing freely, served to measure the local hardness H of the metal, from the inverse proportionality between H and the logarithmic damping decrement. The so-called "pendulum hardness" is shown to be proportional, in a broad interval, to the Brinell and the Vickers hardness. Details of H were made both in an inactive liquid medium (kerosene or paraffin oil) and in the presence of a surface-active compound (0.1% stearic acid in 2% acetic acid, as a function of the no. N of oscillations of the pendulum). In an in-

active medium, as in air, H of Zn first increases with N , passes through a max. (at about $N = 5-7$ at 20°), then decreases below the initial value. In a surface-active medium, the initial H is substantially lower than in an inactive liquid, but it rises faster with N , attains a higher max., and then falls slowly, but remains above the initial max. These effects are much more pronounced on a freshly etched surface than on polished Zn or on a surface etched but then exposed to air; e.g., at 20°, on a freshly etched surface: $+\Delta H$ (initial lowering of H in oil or polished surface) $\approx 25\%$; $+\Delta H$ (active active liquid) $\approx 25\%$; $+\Delta H$ (inactive $\approx 21\%$; active liquid) $\approx 25\%$; $+\Delta H$ (inactive $\approx 21\%$; active liquid) $\approx 25\%$. On freshly etched with concd. HNO₃, the corresponding figures are, resp., $-\Delta H$, $+\Delta H$, $+\Delta H$. On Zn, in an inactive medium, H first increases with N and reaches rapidly a const. level. In an active medium, one observes, in addition to the strong initial decrease of H , a peculiar increase of H by bounds; at the beginning of each detn., H is high, then falls off gradually, with the whole stepwise curve rising uniformly and reaching, at a high N , a value of H markedly higher than the const. H attained in the inactive const. between 10 and 75° in with Zn, $+\Delta H$ remains const. between 10 and 75° in an inactive medium, in the surface-active soln. it passes through a high max. at about 20°, $-\Delta H$ passes through a shallow min. With Cu, $+\Delta H$ in an active medium increases with the temp., 6 times at 100°; at still higher temps., detns. become difficult owing to evapn. but indications are that, above 100°, the shape of the curve of H against N becomes close to that of Zn at 20°. The initial de-reat of H observed in the surface-active medium is interpreted by an increase of the no. of slip planes and, consequently, a higher degree of plastic deformation. In an active medium, the same mechanical action will give rise to a higher degree of cold-working, and the same degree of cold-working will be attained after a smaller no. of impacts. N . Thou

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REBINER, P. A., ACAD

USSR/Physics Plastic Deformation Cold-Hardening

Nov 48

"Development of the Plastic Deformation Region and Cold Hardening During Deformation of a Metal in the Presence of Surface-Active Substances," T. Yu. Lyubimova, Acad P. A. Rebiner, L. A. Shreyner, Div of Dispersed Systems, Inst of Phys Chem, Acad Sci USSR, 3 pp

"Dok Ak Nauk SSSR" Vol LXIII, No 3

Variations in hardness with removal from the surface show extent of cold-hardening zone. Direct observations of the deformation zone show the region of external dispersion of metal grains is greater during deformation in an active medium. Dispersion of crystallite also proceeds more intensely. Submitted 27 Sep 48.

PA 55/49T104

REBINDER, P. A.

Jan/Feb 49

USSR/Chemistry - Colloids
Chemistry - Relaxation

"Measurement of Relaxation in Structurally Colloidal System," S. Ya. Veyler, B. I. Likhtman, P. A. Rebinder, Inst Physicochem, Acad Sci USSR, 3 pp

"Kolloid Zhur" Vol XI, No 1

Subject method for measuring period of relaxation is based on tangential mixing of plates in colloidal system under conditions of limited constant deformation. Shows lack of relationship between period of relaxation and amount of initial elastic deformation in construction of hydrozol gelatin. Submitted 20 Mar 48.

PA 45/49T18

REBINDER, P. A.

"On the Fiftieth Anniversary of the Birth, and Twenty-fifth Anniversary of the Scientific Activity, of Academician P. A. Rebinde," M. P. Vooarovich, B. Ya. Yampol'skiy.

Kolloid Zhur., Vol XI, No. 2, Mar/Apr 49

PROCESSING AND PROPERTIES INDEX

2

CA

Use of the penetrating-cone method for the characterization of structure-mechanical properties of viscoplastic bodies. P. A. Rebinder and N. A. Semenenko. *Doklady Akad. Nauk S.S.S.R.* 64, 835-8(1949).—A cone of angle φ penetrates into the viscoplastic body at the rate $V = (dk/dt) \cos(\varphi/2)$ (k = depth of penetration at time t), under the action of a const. load F resulting in the shearing

stress $P = (1/3)F \cos(\varphi/2)$, where S = contact area, $P = kP/k$, with $b = (1/3)g/\sigma \cos^3(\varphi/2) \sin(\varphi/2)$. The limiting shearing stress P_m , i.e. the min. P , corresponding to equil. between the external force and the strength of the plastic body, is detd. by the intercept of the $V(P)$ curve on the P axis, or as the limit of $P(k)$ when k increases to its max. k_m . This limit is not accurately defined owing to creep following attainment of k_m . Nevertheless, P_m has a definite meaning, as evidenced by its independence of F and of φ (between 45 and 90°); e.g. for a suspension of Al_2O_3 (29.5 vol. %) in nonpolar paraffin oil, at 19°, $\varphi = 45^\circ$, F from 20 to 900 g., $P_m \sim 220$ g./sq. cm., and for a consistent Ca soap grease (solidol), measured 24 hrs. after mixing, $P_m \sim 12$ g./sq. cm. at both $\varphi = 45$ and 90°. The invariance of P_m is contingent on absence of changes of homogeneity or of d. under the action of the penetrating cone, and on perfect plasticity. For sufficiently fluid thixotropic systems, the P_m detd. by the cone method coincides with the value obtained by the method of the tangentially displaced plate (Veller and R., *C.A.* 40, 5063); with brittle bodies, the cone method gives P_m about 3 times higher. P_m , detd. by the "cone plastometer," ceases to be invariant in the presence of nonhomogeneous distribution in depth, e.g. for sedimentation structures or structures formed by freezing of an undercooled melt. N. Thon

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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RELATIONS

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PROCESSES AND PROPERTIES INDEX

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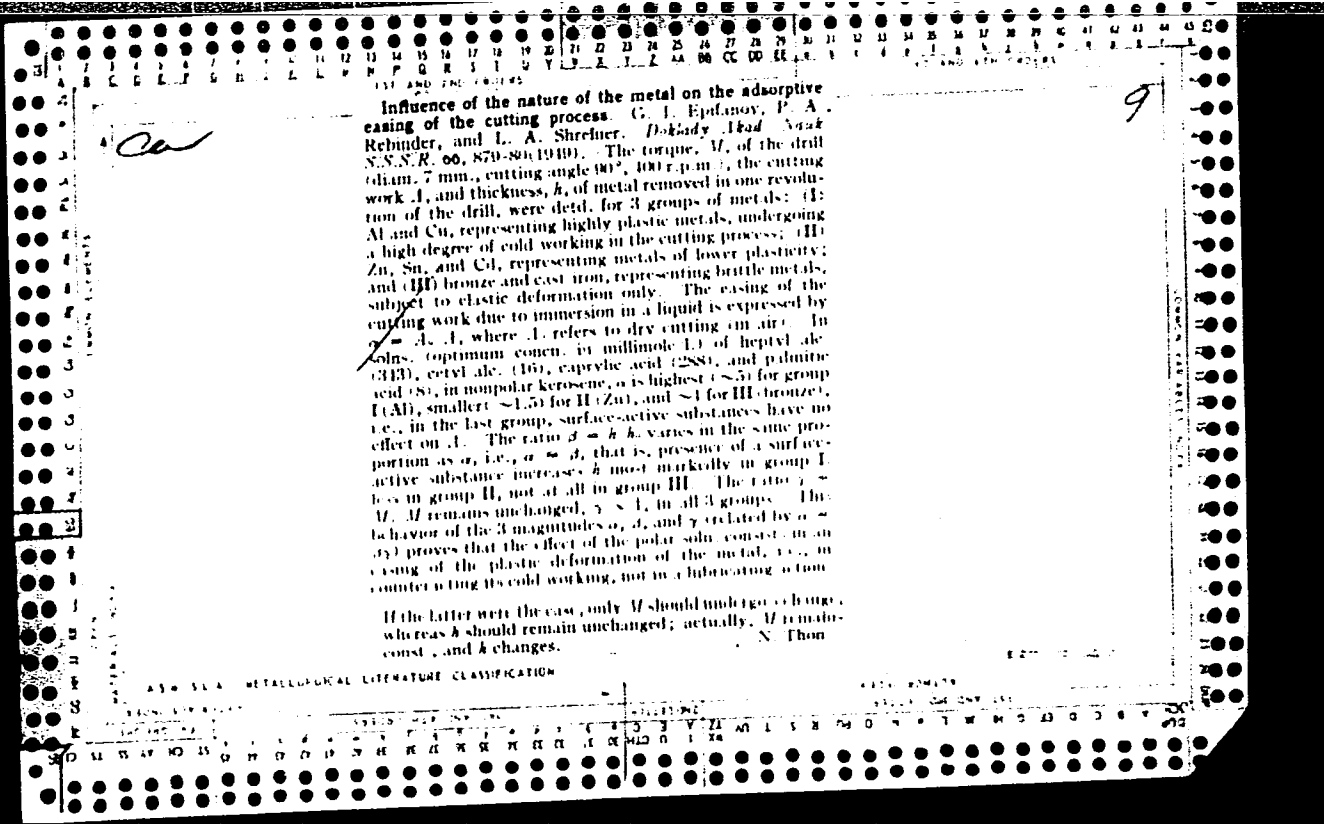
Energy balance of the process of cutting metals. U. I. Epifanov and P. A. Rebinder. *Doklady Akad. Nauk S.S.S.R.* 66, 653-6(1949).—The amt. of energy absorbed as excess potential energy of the crystal lattice of the plastically deformed shavings produced in the drilling of Al, detd. by the difference of the mech. work A and the calorimetrically measured evolved heat Q , proved to be but a very small fraction of A ; its variation in the presence of capillary-active substances is within the limits of exptl. error. Thus, in nonpolar kerosene, and in solns. (concn. in millimoles/l.) of caprylic acid (288), palmitic acid (8), heptyl alc. (343), and cetyl alc. (81), $100(A - Q)/A = 2.8, 0.8, 1.6, 1.8,$ and 1.1% , resp. At equal thickness of the removed metal layer (equal time of drilling), presence of capillary-active substances decreases Q about 2-3 times as compared with the pure nonpolar solvent. The insignificance of the fraction of the total energy absorbed owing to plastic deformation in the drilling process, is attributed to a sort of snta. phenomenon wherein, beginning with a certain degree of cold-working, further strain results in no further absorption of energy. This point is not reached in the usual expts. of plastic deformation of metals. For Al, the work of cutting is of the order of 10^{10} ergs/sq. cm., the absorbed energy of the order of 10^6 , i.e. about 1%, in agreement with the expt. N. Thon

*Academician, Div. of Dispersed Systems,
Inst. Phys. Chem., AS, 1949.*

METALLURGICAL LITERATURE CLASSIFICATION

FROM 804177

FROM 804177	FROM 804177	FROM 804177	FROM 804177
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z



PA 3/50771

DEFENDER, F. A.

USSR/Metals - Hardness
Electrocapillary Effect

11 Sep 49

"Electrocapillary Effect of Decreasing the Hardness of Metals," Ye. K. Venstrem, Acad. P. A. Koshinder, 4 pp

"Dok Ak Nauk SSSR" Vol LXVIII, No 2

Studied fine-crystalline samples of thall, or zinc, lead, tellurium (pure for analysis), and graphite (mineral of the Kureyka deposit). Studied previously discovered dependence of hardness on polarization for various pure metals in a wide range of polarization values, including electrocapillary maxima.

Comparison with data of Bruns and Chugunov on wettability of artificial Acheson graphite was not possible. Submitted 13 Jul 49.

3/50771

REF ID: A661

USSR/Physics - Fatigue of Metals
Adsorption Effect

21 Sep 49

"The Adsorption Effect for Sign-Variable Torsion in Connection With the Problem of Metal Fatigue," P. D. Novokreshchenov, N. Ye. Markova, Acad P. A. Rebinder, Voronezh State U, Dept of Dispersion Systems, Inst of Phys Chem, Acad Sci USSR, 4 pp

"Dok Ak Nauk SSSR" Vol LXVII, No 3

Results of detailed study of deformation of tin in the form of poly- and monocrystalline wires. In one-sided torsion of pure tin wire under simultaneous action of stretching load of 119 g, substantial reduction of the torque M corresponding to the given angular deformation was observed under influence of adsorption of oleic acid from nonpolar hydrocarbon liquid. Effect was observed for low torsion speeds (of order of 0.045) rpm. Data shows that adsorption effect increases in deformation and reaches very high values near the breaking point. In studying sign-variable torsion under simultaneous stretching by static load for constant amplitude of ϕ_0 and the angle ϕ varying sinusoidally with time, adsorption effects became very apparent at comparatively small periods of the cycle ϕ_0 4 to 8.5 min.

Submitted Jul 49

PA 149T82

REBINDER, P. A.

*The Influence of Experimental Conditions on the Adsorption Effect in Facilitating Deformation of Metal Single Crystals.
P. A. Rehbinder and V. I. Lashman (Doklady Akad. Nauk S.S.S.R., 1948, 62, (2), 219-222).—[In Russian]. The importance of choosing the most suitable experimental conditions for work on the influence of surface-active media on deformation processes is discussed. The negative results of Komaley (*Nature*, 10:10, 163, 404; *M.A.*, 17, 6) are explained by: (a) wrong etching of the single crystals, (b) unsuitable rate of extension (0.2-0.35%/min. instead of 5-10%/min.), and (c) failure to use non-polar grease in the control experiments. Maslennikov showed that the deformation of Sn single crystals with no surface propn. exhibits strong dependence on the presence of surface-active media. The critical stress rises by approx. 100% in an atmosphere saturated with *n*-butylic alcohol vapour, whereas no hardening is observed if the test is carried out *in vacuo*. R. and L. have recently shown that the properties of surface-active media are well studied in respect of their effect on creep. This is explained by the fact that the microcracks cannot close. Venstrom showed that the creep rate of Sn single crystals immersed in a 0.2% soln. of oleic acid in kerosene is approx. twice that in pure kerosene. In the presence of a 0.3% soln. of cetylric acid in paraffin, the creep rate accelerates earlier than in oleic acid.—Z. S. B.

Rebinder, P.A.

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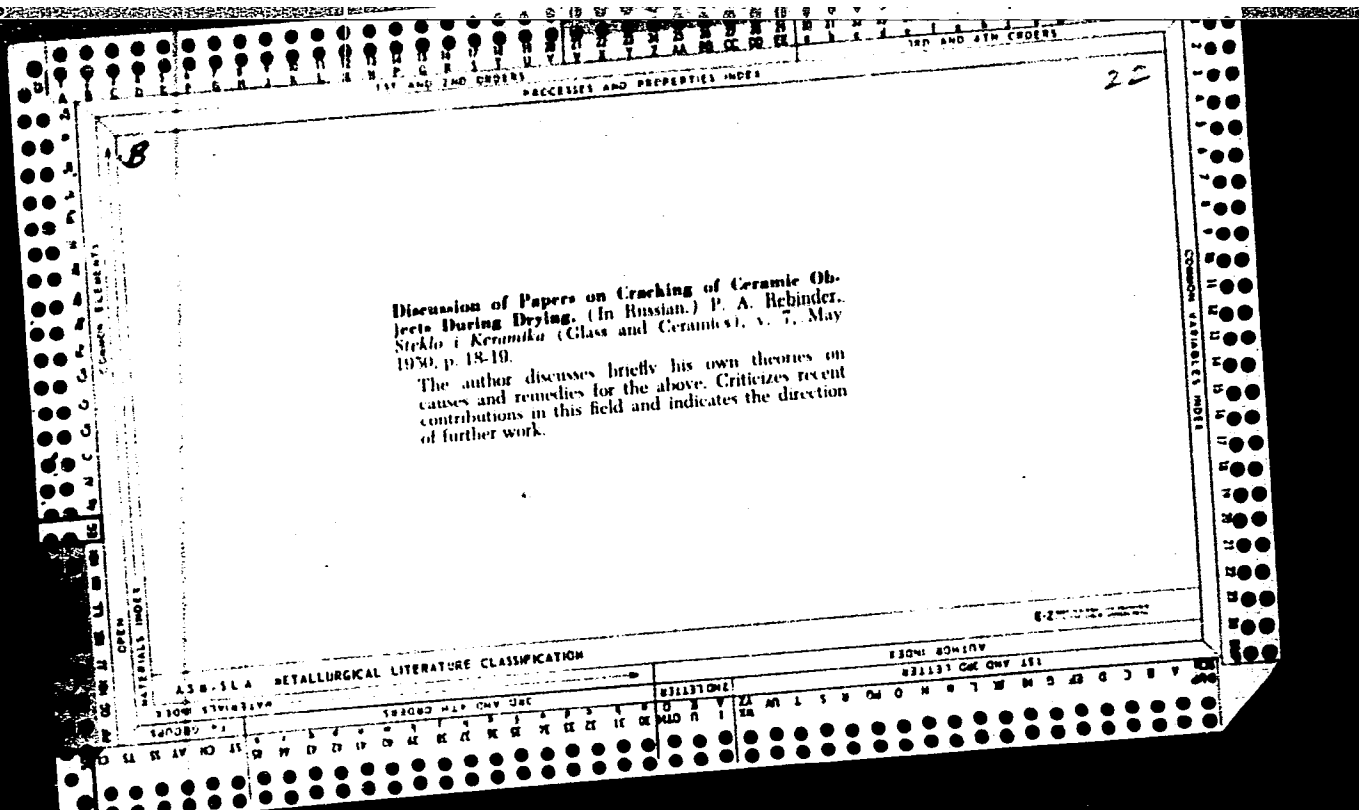
New methods of characterization of elastic-plastic-viscous properties of structurally dispersed systems and solutions of high polymers. P. A. Rebinder. *Akad. Nauk S.S.S.R., Trudy Inst. Fiz. Khim.* No. 1, *Izv. Akad. Nauk S.S.S.R., Ser. Khim. i Tsvetok.* No. 1, 1960; *Mezhd. Rev. Fiz. Khim.* 1960, 34, 6228. — Math. By comparing the curves for the kinetics of deformation, the changes of the elastic-viscous consts. in solns. vs. temp., the degree of spatial occupation vs. elasticity modulus, and the limiting deformation vs. shear stress for solns. or suspensions of bentonite (I), other clayey materials, gelatin (II), Buna S, smoked sheet rubber, and I with admixts. of ethylene glycol, glycerol, formamide, or EtNH₂, it is concluded that the ratio P_L/P_0 expresses a characteristic value, where P_L is the limiting value of the elastic force up to which the relaxation process will proceed, and P_0 is the initial value of the elastic force, defined by a given magnitude of deformation. This ratio, e.g., varies from 0.40 to 0.57 for pure I, and from 0.44 to 0.59 for I with the admixts.; it is 0.850 for II. An app. is presented for measuring P_0 and P_L ; several formulas are derived to obtain P_L and P_0 individually and their ratio. Thus the ratio can be calc'd. from $P_L/P_0 = E_1/(E_1 + E_2)$, where E_1 is the rigidity modulus, and E_2 the modulus of elasticity. Werner Jacobson

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REBINDER, P.A.

The importance of flocculation and frothing in flotation concentration processes. Trudy Soveshchaniya Teorii Flotatsion. Obogashcheniya, Moscow '48, Rol' Gazov i Reagentov v Protssessakh Flotatsii '50, p.13-31.
(CA 47 no.13:6317 '53) (MLRA 3:11)



Theory of vulcanization of synthetic rubbers. A. P. Pisarenko and P. A. Rebindet. *Legkoi Prom.* 10, No. 9, 10 2(1950), cf. C. I. 44, 10365a. Review of literature and some exptl. work. Effect of vulcanization can be obtained by (1) difficultly destructible "rigid" intermol. bonds of the S bridge type, (2) elastic, and, to a considerable degree, reversible polar bonds. Addn. to the vulcanizates of plasticizers and substances which solvate the polar groupings facilitates the reversibility of the process. B. Z. K.

2001

Crude Natural rubber

Elastic viscous properties of rubber solutions.
 A. S. KOLYASNIKOVA and V. A. KOUTSKAYA
Izv. Akad. Nauk SSSR, 1964, 12, 191-207; Zh. Fiz. Khim., 1964, 44, 3479-80. A porous brass cylinder was virtually supported by a torsion wire in a rubber solution in an outer cylinder. The wire was twisted and the increase of shearing stress, σ , with time was determined at constant torque. The shearing stress increased rapidly (in 1 sec) and reversibly to a constant value from a low and finally linearly (for some time). Extrapolation of the linear part to zero time gives τ_0 . The initial shearing modulus, E_0 , is the elasticity modulus, E , at the time of the onset of viscosity during the low σ part, E_0 and the viscosity of elastic deformation, η_e , were independent of apparatus, and of torque between 10 and 200 dyn/cm². For benzene solutions of smoked sheet they increased from 110, 4,560, and 1300 to 27,100, 2500, 63, 109, and 17, 10¹⁰ erg/cm² respectively when the concentration was increased from 3 to 20%. When the concentration of sodium butadiene rubber in benzene increased from 6 to 20%, the τ_0 values increased from 200, 160, 28, 109, and 8400, respectively, to 2,480, 1200, 32, 109, and 10, 10¹⁰ erg/cm² respectively. The ratio E_0/τ_0 (τ_0 in E_0) was independent of concentration, being 0.9 for smoked sheet and 0.6 for the synthetic rubber. For 15% solutions of the latter in xylene, E_0 decreased linearly when temperature T increased from 10 to 80°C, and τ_0 and η_e decreased according to: $\log \eta_e = A + B/T$ (A, B , constants). E_0 also decreased, especially between 10 and 20°C. The decrease in torque was determined with constant shearing stress. The system was likened to a combination in series of a Maxwell and a Kelvin unit. The periods of relaxation calculated for this system from the known values of E_0 , τ_0 , η_e , and η_e agreed with experiment. Viscosity of 15% solution of sodium-butadiene rubber in xylene, determined in a rotational viscometer, was independent of shearing stress at very small stresses; it was equal to η_e .

33465

Effect of addition of fillers and surface-active substances on the deformation properties of rubber solutions. A. S. Kolhanovskaya, P. A. Rehbinder, and O. I. Luk'yanova. *Kolloid. Zhur.* 12, 208-17 (1950); cf. preceding abstr.

Addn. of more than 4.8 vol.-% of C black (I) (particle size 0.02-0.05 μ), or > 0.7 vol.-% of SiO_2 (II) (particle size 2.5 μ), or > 8.8 vol.-% of ZnO (III) (6.8 μ) to a 15% soln. of Na-butadiene rubber in xylene gave a yield value P_k . The magnitude of P_k was detd. more exactly by finding the value which makes the expression: $(P/P_k) \cdot (d/d_0)$ a const.; it was, e.g., 45 dynes per sq. cm. for 8% I. Smaller addns. of fillers increased E_1 , E_2 , η_1 , and η_2 but little, but this increase became steep at filler concns. > 5% I, > 7% II, or > 8% III; at these concns. structure appears in the systems. The strengthening effect increased in order III-II-I; e.g., at 8% addn. E_1 was 17,000, 6000, and 1800 for I, II, and III, resp. Stearic acid (IV) activated III, e.g., E_1 and E_2 of the system contg. 5.2% III was raised from 1000, resp. 44 to 2450, resp. 100 by addn. of 1 wt.-% of IV. Further addn. of IV did not intensify its effect. In the absence of fillers, 0.1% IV depressed, and P_k IV had no effect on, η_1 , E_1 , E_2 , and η_2 were scarcely affected by IV. Sebacic acid acted similarly to and more intensely than IV. BuNH₂ lowered η_1 and E_1 . Benzidine greatly increased E_1 , E_2 , and η_2 . Azobenzene slightly increased E_1 and η_2 . I. I. Bikerman

C.A.

2

Filtration analysis and characterization of the structure of suspensions and sediments. L. B. Chernenko and P. A. Rebinder. (Technol. Inst. Food Ind., Moscow). *Kolloid. Zhur.* 12, 386-9; (1950).—If a suspension contg. c g./cc. solids is filtered, the amt. of the ppt. is cV after a vol. V has passed through. If the amt. cV occupies the vol. αcV and the area of the filter is S , the thickness h of the ppt. is $\alpha cV/S$. From Darcy's equation, then, $dV/dt = KS^2p/\eta\alpha cV$; t is time, p driving pressure, and η viscosity. Hence, $V^2 = 2KS^2p/\eta\alpha c$. The proportionality between V^2 and t

was confirmed by filtering suspensions of *rye flour* and *clay* in H_2O , and of *ZnO* in toluene. If the porosity of the ppt. changes during filtration the exponent at V^2 differs from 2. The ratio $K/S/\alpha$ is characteristic for a given solid; $\log(\alpha/KS)$ was 8.3-8.5 for rye flour between c 0.10 and 0.18. The value of K can be found by filtering pure dispersion liquid through the ppt. (i.e. at const. h). Then also α can be detd., and from it the porosity of the ppt. can be calcd.

I. I. Bikerman

REBINDER, P. A.

Article in Uspekhi Khimii, Vol. 19, No.1, 1950, entitled "Progress of Soviet Chemistry in the Stalin Period."

"In the field of surface phenomena, P. A. Rebinder introduced new concepts characterizing properties of solids. In the course of Rebinder's work, new effects in the mechanical treatment of solids which are caused by surfacelayers and the addition of small quantities of surface active compounds were discovered. The effects in question are of considerable importance in mechanical deformation and mechanical working.

REHBINDER, P. A.

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The Influence of Surface-Active Lubricants on the Processes of Pressing and Sintering of Powdered Metals. V. I. Likhtman and P. A. Rehbinder (*Doklady Akad. Nauk S.S.S.R.*, 1950, 70, (5), 851-853).—[In Russian]. The influence of surface-active media on the processes of pressing and sintering of metal powders was studied. The surface-active medium employed was a soln. of oleic acid in either benzene or Vaseline grease, and the metal powders studied were Fe, Cu, and Sn. 5-10 mg. oleic acid in soln. to 1 g. of the metal powder ensured a monomolecular adsorbed layer. Powder treated with the benzene soln. had improved flow properties after evaporation of the benzene. The powders were pressed in cylinders of 12 mm. dia. The pressure necessary to obtain a given d was decreased by 10-20% by the presence of the adsorbed layer. This lowering is too great to be accounted for merely by the prevention of friction against the walls of the cylinder, and must be due to the facilitation of plastic deformation of the particles. The presence of surface-active media also influences the magnitude of the elastic expansion of compacts after pressing out of the cylinder. For Cu compressed at 20-40 kg./mm.², the elastic expansion was decreased 2-3 times, and for Sn made at 5-10 kg./mm.² it was decreased by 5-8 times. The presence of surface-active media increases resistance to corrosion. During sintering the surface-active medium is completely burnt away, but the physico-mech. properties of the product are better in comparison with those of the dry compacts prepared at the same pressure. Even at the same porosity, the quality of the compact made in the presence of surface-active media is somewhat better, as a result of the more even distribution of internal stresses introduced during pressing.

—Z. S. B.

CA

Klasto-plasto-viscous properties of structured disperse systems P. A. Reblinder and B. B. Segalova (Lomonosov State Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* 71, 85 8(1960). Kinetic curves of the increase of the shear σ with the time τ , under a const. stress P , are of 2 types. At P below P_0 (upper elastic limit or yield point), σ reaches a max. σ_m and remains const.; the strain is completely reversible. At $P > P_0$, the residual deformation σ_r increases continuously, with $d\sigma/d\tau$ tending to a const. min. $(d\sigma/d\tau)_0$. After removal of the stress, $\sigma_r = \tau_0 (d\sigma/d\tau)_0$, where τ_0 = length of time of application of the stress. With the instantaneous or initial σ_0 conventionally defined as the σ developed at the initial stage $\tau_0 \approx 1$ sec., both σ_0 and the elastic deformation $\sigma_m - \sigma_0$ remain const. in the flow for any length of time. The transition from one type to another is detd. by the value of P_0 . Further characteristic magnitudes, invariant towards the particular type of app. used and, in the range of shearing stresses not high enough to produce structural disruption or orientation in the flow, also towards P , are: the initial shearing stress $E_0 = P/\sigma_0$; the true (relaxational) viscosity $\eta_1 = P'/(d\sigma/d\tau)_0$, where $P' = P - P_0$, or, within any time τ_1 after unloading, $\eta_1 = P'(\sigma_r/\tau_1)$; the modulus of elasticity $E_0 = P/(\sigma_m - \sigma_0)$; the conventional viscosity of elastic aftereffect, $\eta_2 = P'/(d\sigma/d\tau)_0 - (d\sigma/d\tau)_0$. These magnitudes are derived from $\sigma(\tau)$ curves obtained by the method of tangential displacement of a plate in a plane alt or by

the cylinder-torsion method. For systems such as sols of metal soaps in hydrocarbons with addns. of surface-active substances, coagulation structures formed by microcrystallites of paraffin in petroleum products, rubber sols., colloidal suspensions of bentonite clays in H₂O, etc., E_0 was found to vary between 1×10^8 and 3×10^8 dynes/sq. cm., K_1 from 8×10^{-1} to 2×10^0 dynes/sq. cm., η_1 from 7×10^2 to 7×10^6 , η_2 from 7×10^2 to 1×10^4 , P_0 from 0 to 2×10^8 dynes/sq. cm. The relaxation times calcd. from these characteristics are 30-60 sec. for rapid

lastic, and 5-17 hrs. for true relaxation of the stresses. N. Thon

1950, P.A.

(4)

6

Investigation of the lubricating action on a model of deep drawing. S. Ya. Veller, L. A. Shreluer, and P. A. Rebinler (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *Doklady Akad. Nauk S.S.S.R.* 73, 511-13(1950).—A band of metal folded in a U-shape is drawn out with the aid of a vertical die, between 2 horizontal cylindrical matrixes, and the normal compressive stress N exerted between the matrixes and the die is recorded by an indicator connected with the spring dynamometer housing the matrixes. These detns. of N , along with the tangential stress P (identical with the vertical load acting on the die), give the conventional friction coeff. $f = P/N$, the effective stamping stress $\sigma_1 = P/2S_1$, and the stretching stress $\sigma_2 = P/2S_2$, where S_1 = area of the cross-section removed, and S_2 = area of the cross-section after reduction. For a given metal, σ_1 remains const. independently of the degree of reduction, and varies depending on the medium. Thus, a $10 \times 10 \times 1$ -mm. steel sample gave, between 7 and 50-

60% reduction, in CCl_4 , dry, in spindle oil, in 60% gelatin gel, and in oxidized paraffin, σ_1 (mean) = 100, 72, 67, 61, and 44 kg./sq. mm., resp., and brass, dry, in 5% aq. Na oleate, in oxidized paraffin, and in CCl_4 , σ_1 (mean) = 55, 33, 25, and 83 kg./sq. mm. The lubricant detns. also the max. possible reduction, e.g., for steel in CCl_4 , in mineral oil, and in oxidized paraffin, it is 49, 57, and 65%, resp. The increased ability of the metal to be drawn out in the presence of lubricants is due not only to reduced friction, but also to the greater ease of surface flow in the presence of surface-active substances. The stretching stress σ_2 increases with the reduction; its max. value, at rupture, varies between narrow limits, and shows some parallelism with f ; the latter magnitude, for steel, at $P = \text{const.}$, was found = 0.28 in CCl_4 and 0.15 in oxidized paraffin.

N. Thon

Evaluation B-79294

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Increase of the adhesion of polar adhesives on resins. S. S. Voyutskii, E. A. Rebindler, E. S. Khoroshaya, and S. I. Shur (M. V. Lomonosov State Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* 73, 747-50 (1950). —The effects of various surface treatments on the wettability with H_2O (B), measured by $B = \cos \theta$ (the quasi-equil. contact angle), and on the adhesion (A) of polar adhesives (nitrocellulose or perchlorovinyl glues), were investigated on different samples of com. resins. On a Na butadiene resin, an initial $B = +0.174$ and poor A were not improved by 20-min. treatment with 98% H_2SO_4 . Abrasion with emery paper lowered B to -0.309 and did not improve A . However, combined abrasion and treatment with H_2SO_4 resulted in a rise of B to $+0.650$ and considerable improvement of A . This checks with other observations to the effect that with poorly wettable surfaces, increase of the surface roughness lowers the spreading of the liquid, whereas with highly wettable surfaces, an increase of the surface roughness in-

creases the wettability still further. On preliminarily emery-abraded resin surfaces, the gain in B increases with the length of the treatment with H_2SO_4 . In terms of the strength of the acid, 20% H_2SO_4 is without effect; max. B and A are attained with 78% H_2SO_4 . Cold HCl has no effect, but boiling HCl improves both B and A . Oxidants, in the 1st place an alk. soln. of $KMnO_4$, to a somewhat smaller degree $Cl_2 + H_2O$ and H_2O_2 , improve B ; A was found improved by $KMnO_4$ and $Cl_2 + H_2O$, but not by H_2O_2 . Treatment with $Br_2 + H_2O$, 5 min., increased both B and A markedly; an alc. soln. of I_2 had a similar but less-marked effect. Treatment of the rough surface with CaH_2 or $C_2H_2Cl_2$ had no effect, and Me_2CO resulted in some lowering of B . Higher temp. always results in greater improvement of B and A . Washing with H_2O after the chem. surface treatment always detracts from its beneficial effect on B . As for A , there is an optimum of the length of washing at which A is max. This is taken to indicate the presence, on the surface, of polar products of the chem. treatment; protracted washing, insofar as it removes the residual reagent, is favorable to A , but the removal of the polar reaction products will lower the polarity of the surface and detract from A . On natural rubber (film obtained by evapn. of a C_6H_6 soln. of smoked sheet), the initial B was found $- +0.123$, rising to $+0.515$ after the combined mechanical and chem. surface treatment. Similar results were obtained on treatment of Na butadiene and polyisobutylene rubbers with Cl_2-H_2O . The improvement of B and A through surface treatment with H_2SO_4 , halogens, or oxidants, is attributed to an increase of the hydrophilicity, i.e. the polarity of the surface.

N. Thon

LA

The vulcanization of synthetic rubbers. A. P. Pisarenko and P. A. Rebnider (Inst. Phys. Chem., Acad. Sci. U.S.S.R., Moscow). *Doklady Akad. Nauk S.S.S.R.* 73, 129-32 (1950). Only a small fraction of the total S bound in the process of vulcanization, 7-10% in natural and 2-6% in synthetic rubber, forms spatial bridges between the macromols. On the other hand, vulcanizates can be obtained with as little as 0.1-0.2% bound S (relative to the wt. of the rubber). The role of the bridge S in vulcanization appears entirely secondary. The main effect of the bound S is detid. by its addn. to double bonds and formation of polar groups; the high cohesive forces of vulcanized rubbers are due to attraction between such polar groups. This point of view is corroborated by the decrease, with rising temp., of the mech. strength of vulcanized rubbers, illustrated by curves for diacrylo nitrile, Na-butadiene, and polychloroprene rubber. Vulcanization effects are observed under conditions where bridge formation by bound S is still out of the question. Swelling in $C_{6}H_6$ vapor resulted in a regular fall of the strength and the elongation on rupture of vulcanizates, very nearly proportional to the amt. of absorbed C_6H_6 , and fully reversible on elimination of the C_6H_6 ; this effect is analogous to that observed in unvulcanizable plastics of the type of polyvinyl acetate and chloride or polyvinylidene chloride, where intermol. bonding is due to polar groups. In the vulcanization of Na-butadiene rubber with S, admixt. of C black decreases the fall of the degree of unsw. and favors reversal of the vulcanization; this is an indication that vulcanization is largely a matter of addn. to double bonds. N. Thon

REBINDER, P. A.

184T25

USSR/Chemistry - Thixotropic Mixtures Jan/Feb 51

"Structure Formation and Elastoplastic Properties of Structures in Oil and Aqueous Suspensions of Aluminum Oxide," L. I. Edel'man, P. A. Rebinder, Chair of Colloid Chem., Moscow State Univ., (C1551-2)

¹³ 'Kolloid Zhur.' Vol. XIII, No 1, pp 64-77 ¹⁹⁵¹

Investigated elastic, plastic, viscous, and thixotropic properties of aq and oil suspensions of Al_2O_3 , and effects of admixts of surface-active substances, electrolytes, and colloidal fraction of $Al(OH)_3$ sol on these properties.

LC

184T25

REBINDER, P. A.

183T20

USSR/Chemistry - Foams

May/June 51

"Investigation of the Stability of Monodisperse Foam," Ye. M. Savitskaya, P. A. Rebinder, Chair of Colloid Chem, Moscow State U imeni M. V. Lomonosov

"Kolloid Zhur" Vol XIII, No 3, pp 200-207

Expanded treatment of identical subject covered by article "Stability of Monodisperse Foam," same authors, "Dok Ak Nauk SSSR" Vol LXXVI, No 3, 1951, pp 427-429 (cf. FDD Per Abs 178T14).

ID

183T20

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BA

Stability of monodisperse foams. E. M. Savitskaya and P. A. Rebinder (Moscow State Univ.). *Doklady Akad. Nauk S.S.S.R.* 70: 427-9(1951).—The stability of foams of different dispersities produced by air led through orifices of different diams. into solns. of Na 6-butyl-1-naphthalene-sulfonate and the Na salt of the dioctyl ester of sulfosuccinic acid was detd. by the time elapsing until 1st appearance of a mirrorlike surface (i.e. free from bubbles), under conditions of free evapn. in an atm. of satd. vapor of the solvent, and in a closed space (without gaseous atm.). The stability of each foam increases in that order, being greatest in closed space. The stability of the foam increases with its dispersity and its height, and decreases with increasing area of the surface in contact with the vapor. N. Thon

1951

CA

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Structure formation and elastic-plastic properties of aluminum hydroxide gels. I. I. Kiselev and P. A. Rebindey (Moscow Univ.), *Kolloid. Zh.* 13, 142 (1951); cf. *C.A.* 43, 3044d. The starting $Al(OH)_3$ sols were prepd. by hot hydrolysis of Al diacetate and aging for 3 months or 3 yrs. (sol I) or by peptizing pptd. $Al(OH)_3$ with HCl and dialysis. The 0.5% sols became thixotropic on addn. of 0.25-0.6 mole NaCl, 0.003-0.02 mole Na_2SO_4 , or 0.002-0.003 mole Na_2HPO_4 per l. The mech. behavior of the gels between two concentric cylinders of which one, on a torsion wire, is turned from the equil. position, can be described by means of 5 independent parameters: E_1 , E_2 , η_1 , η_2 , and P_0 . E.g., E_1 increased from 7000 to 16,000, E_2 from 6800 to 27,000 dynes/sq. cm., η_1 from 2×10^7 to 13×10^7 poises, and P_0 from 50 to 600 dynes/sq. cm. when the concn. of Na_2HPO_4 increased from 0.0015 to 0.003 M. The increase of the gel concn. from 0.2% to 1% increased all these parameters, e.g., 20-50 fold. When a gelatine gel was disturbed and allowed to set, the final E_1 was independent of the stage during which the disturbance took place. After several disturbances of the structure the gels ceased to be thixotropic. Disturbance of aged gels was less effective than that of fresh gels. Addn. of Al_2O_3 powder to sol I increased E_1 , η_1 , and P_0 ; these quantities were max. at about 8% Al_2O_3 in 0.5% I, passed through a min. at 8% Al_2O_3 and were like those of a suspension at higher concns. of Al_2O_3 . These effects were due to the electrolyte content of the Al_2O_3 ; electrolyzed Al_2O_3 made sols into thixotropic gels when its concn. was 12% or more. I. I. B.

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CA

Elastic-plastic properties of oleogels of calcium stearate. E. E. Sogdova, P. A. Rebinder, and L. N. Sentyurikhina (Univ. Moscow). *Kolloid. Zhur.* 13, 461-72(1951); cf. *C.I.* 44, 6236. Solution of $x\%$ Ca stearate (I) + $(30-x)\%$ stearic acid in paraffin oil at 120° and cooling resulted in gels whose "plastic strength" P_s (deter. in a conical plastometer) linearly increased from 200 at $x = 20\%$ to 1700 g. wt./sq. cm. at $x = 0\%$. After stirring, P_s of these gels became very small and then slowly increased. Mixts. of $x\%$ I + $ay\%$ oleic acid in paraffin oil formed gels if a was between 0.1 and 1.5. P_s of "condensation" gels (II) (i.e. produced by cooling) and of "dispersion" gels (III) (after thixotropic setting) was max. at $a = 0.4$. When a plate was slowly withdrawn from a container 2.7 cm. wide (filled with III) by stress P (dynes/sq. cm.), the rate of withdrawal ds/dt gradually decreased to zero as long as $P < P_s$; at P_s and greater stresses ds/dt gradually decreased to a const. value which was greater, the greater P . At even greater P , ds/dt after being const. for a time rapidly increased. At $P > P_s$, the plate did not return to the initial position after taking the stress off. The remaining deformation ϵ_m and deformation ϵ_0 produced at once after application of stress P increased linearly with P . For $y = 30$ and $a = 0.4$, ϵ_0 was 2×10^{-4} cm. at $P = 12,000$ and 48,000 for III and II, resp., and ϵ_m was 2×10^{-4} cm. at $P = 6000$ and 38,000, resp. The relaxation viscosity η_1 and after-effect viscosity η_2 were independent of P . At $a = 0.4$ the yield stress P_s (kilodynes/sq. cm.) was 137 and 32 for $y = 20\%$.

300 and 44 for $y = 30\%$, and 500 and 306 for $y = 40\%$, in II and III, resp. At $y = 30\%$, P_s was 137 and 32 for $a = 0.4$, 64 and 29 for $a = 0.6$, 39 and 23 for $a = 0.8$, and 20 and 16 for $a = 1.0$, in II and III, resp. In all III systems P_s/P_0 was approx. 7. The growth of P_s , η_1 , η_2 , and modul. of elasticity during thixotropic setting of $y = 40\%$, $a = 0.04$, is shown in graphs and a table. I. I. Bikerman

P. A. REHBINDER

3 5

Metallurgical Abstracts
July 1954
Structure

1 *Characteristics of the Changes in Crystal Structure of a Metal (Copper) During Deformation in Surface-Active Media. V. N. Rozhansky, T. A. Amilcatrova, and P. A. Rehbinder (Doklady Akad. Nauk S.S.S.R., 1951, 76, (5), 697-698; Russian). The kinetics of the creep of wires (0.05 mm. dia.) of electrolytic Cu under const. load in surface-active and inactive media was investigated, the specimens first being etched in 5% (NH₄)₂S₂O₈ soln., washed in distilled water, and dried with filter paper. Deformation/time curves are given; the rate of extension in a 0.5% soln. of oleic acid (or cetyl alcohol) in non-polar kerosene (v_1) is greater than that (v_0) in the kerosene alone. The effect is greatest at a mean grain-size of 0.03 mm. The curve obtained by plotting $\log(v_1/v_0)$ against extension (ϵ) shows a max. at $\epsilon \approx 0.55\%$. X-ray photographs show that the increase in the number of spots in the Debye rings on extension is greater for specimens stretched in the surface-active media than for those in inactive media. From these photographs, curves showing the variation of n with ϵ , where n is the relative number of grains/unit vol. ($n = 100$ for unstrained specimens), have been plotted to illustrate this. On the basis of analogous experiments with single crystals of Al and Sn, it is concluded that as a result of irregular slip at the start of deformation the crystallites break down into several blocks tilted relative to one another about an axis lying in the plane of slip and normal to the direction of slip. In surface-active media this process begins at lower stresses and takes place more intensely. The block formation results in a ripple structure; the curvature of the crystal planes will be less for specimens in surface-active media than in inactive media.—G. V. E. T.

BTR

14772* *Law of the Development of Highly Elastic Deformation.* (In Russian.) L. V. Chumakova and P. A. Rebudet. *Doklady Akademii Nauk SSSR*, new ser., v. 81, Nov. 11, 1951, p. 239-242.
A mathematical analysis of large elastic deformations is presented. The results are compared with experimental data on natural and synthetic rubber. Data are tabulated and charted.

REBINDER, P. A.

USSR/Engineering - Construction Materials, Oct 51
Cement

"New Physicochemical Methods in Technology of Building Materials," Acad P. A. Rebinder, G. I. Logginov

"Vest Ak Nauk SSSR" No 10, p 47

Discusses effect of surface-active substances on structures and basic properties of cement clinker, Analyzes mechanism of adsorption. classifies adsorptive admixts and reviews publications on the subject, outlining possibilities for controlling technological processes and properties of binding materials in mortars and concretes.

222T27

USSR/Chemistry - Concrete

21 Nov 51

"Sedimentation Processes in Concrete Mixture - Their Effect on the Structure Formation of the Concrete and Its Water-Impermeability," V. V. Stolynskov, Acad P. A. Rebinder, Ye. V. Lavrinovich, Institute of Phys Chem, Acad Sci USSR and All-Union Sci Res Inst of Hydrotechnics Imeni B. Ye. Vedenevets, Leningrad

"Dok Ak Nauk SSSR" Vol XXXI, No 3, pp 431-434

Water is found to seep along the successive horizontal layers of concrete faster than it does perpendicularly to them. If the magnitude of settling due to sedimentation is such that the size of the

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capillaries formed on the surfaces of the grit and filler does not exceed the size of the capillaries in the cement itself, the concrete will be more water-impermeable and will last longer. This can be achieved by the use of surface-active agents such as hydrophilic sulfite-alc wash...

REBINDER, P. A.

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RUSSIAN, V. I.

Polymers and Polymerization

New methods for characterization of the elastic, plastic and viscous properties of structured disperse systems and solutions of high polymers. Trudy Inst. fiz. khimii AN SSSR No. 1, 1952.

9. Monthly List of Russian Accessions, Library of Congress, December 1952¹⁹⁵³, Uncl.

In 1953, ...

"Monthly List of Russian Accessions," Reviewed by W. A. Morgan, W. A. Robinson, W. V. Mitchell w. Jay.
Dated at W. S., 1953.

SO: Monthly List of Russian Accessions, Library of Congress, August 1953², Uncl.

1. VENSTREM, E. K., REBINDER, P. A.

2. USSR (600)

4. Metals

7. Electrocapillary effect of facilitating the deformations caused by elongation of metals. E. K. Venstrem, P. A. Rebinder. Zhur. fiz. khim. 26, No. 12, 1952.

9. Monthly List of Russian Accessions, Library of Congress, May 1953. Unclassified.

STOL'NIKOV, V.V., doktor tekhnicheskikh nauk; REBINDER, P.A., akademik, redaktor.

[Foam-forming admixtures in concrete for hydraulic engineering] Vozdukhovov-
lekaiushchie dobavki v gidrotekhnicheskom betone. Pod red. P.A. Rebintera.
Moskva, Gos. energ. izd-vo, 1953. 167 p. (MIRA 6:9)
(Concrete)

REBINDER, P. A.

4

USSR

The increase in dust-catching properties of water with the aid of wetting agents. P. A. Rebindey, N. N. Serb-Serbina, and S. A. Kordyukova. ~~Harbin~~ ~~Chikago~~, ~~Zhena~~, ~~Nauk~~ S.S.S.R., *Sbornik State*, 1953, 57-68. — The increase in dedusting properties of water to which small doses of wetting agents are added depends upon the ability of such agents to reduce the surface tension of H₂O and upon the extent of their adsorption on the surface of hard particles thrown into the air during mining. In flowing H₂O through the bore in mine drilling the presence of wetting agents in the H₂O also facilitates the process of drilling. The synthesized wetting agents tested were: DB, a mixt. of anionic polyethylene glycol monoalkylphenyl ethers, and OP, a mixt. of similar anionics having a sharp putrid odor. The task of wetting mine-dust particles is made more difficult by the fact that during the process of drilling air bubbles mix with the dust particles preventing the water or wetting agent soln. droplets from getting into immediate contact with the surface of the dust particles. An app. anal method are described for the lab. study of the factors involved in dedusting and of the effectiveness of wetting agents added to H₂O. A series of tests were performed with wetting agents Sulfanol, DB, and OP-7. The results are tabulated and briefly discussed.

B. S. Levine

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Handwritten initials or signature.

RAVDEL', A.A.; KREMNEV, L.Ya.; REBINDER, P.A., akademik.

Boundary dimensions of droplets in emulsions. Dokl.AN SSSR no.4:599-602
Je '53. (MLRA 6:5)

1. Akademiya, Nauk SSSR (for Rebinder). 2. Leningradskiy tekhnologicheskiy
institut im. Lensoveta (for Ravdel', Kremnev). (Drops) (Emulsions)

REBINDER, P.A., Acad. and SEGALOVA, Ye.Ye.

"Investigation of the Processes of Structure Formation in Concentrated Suspensions of Cement," a paper given at the All-University Scientific Conference "Lomonosov Lectures", Vest. Mosk. Un., No.8, 1953

Translation U-7895, 1 Mar 56