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3/

2

A new magnetocaloric effect. N. S. Akulov and L. V. Kirenskii. *J. Phys.* (U. S. S. R.) 3, 31-4(1940)(in German).—Theoretical considerations lead to the conclusion that when a ferromagnetic monocrystal is rotated in a strong magnetic field at low temps. strong periodic cooling and heating must take place. This is verified by expts. on Ni monocrystals. At liquid N temps. the expt. data show good agreement with the course of the curve given by the equation derived: $\Delta T = (4aK/c)T^2(1 - {}^3/_4 \sin^2\varphi)\sin^2\varphi$, where c = heat capacity, φ = angle of rotation and a and K are taken from measurements of Bryukhatov and Kirenskii (*C. A.*, 33, 17[8]). This new effect is quite different from the magnetocaloric effect of Weiss.

F. H. Rathmann

1

Magnetic Lab.
Sci. Res. Inst. of Physics, Moscow State U.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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BC

A-1

Kinetics of phase transformations of steel. N. S. Akulov and N. I. Strutinski (*J. Physics U.R.S.S.*, 1940, 2, 33—41).—An apparatus for the investigation and photographic recording of rapid phase transformations in ferromagnetic metals is described. The sample of steel, in the form of an ellipsoid of revolution, is attached to a quartz or porcelain tube, making an angle with a strong magnetic field. The other end of the tube is attached to a very sensitive tensometer. Change in the saturation which occurs at a phase transformation causes a moment which is registered on the tensometer. The isothermal breakdown of austenite in steel containing 0·95% C was investigated over the range 500° to −100°. A. J. M.

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BC

Law governing the genesis and development of chemical reactions. N. S. Akulov (*J. Physics U.S.S.R.*, 1940, 3, 165—174).—A universal relation between the time required for the spontaneous initiation of a reaction in isothermal conditions, the induction period, and the progress of the ensuing reaction with time, is developed. L. J. J.

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5 19

Magnetic Analysis of Metals. N. S. Akulov. (Vestnik Metallopromyshlennosti, 1940, No. 4–5, pp. 123–129). (In Russian). Developments in Russia in the field of magnetic inspection and analysis are surveyed. A number of automatic or semi-automatic instruments have been constructed for the control of heat-treated steel parts. Of considerable interest is the use of magnetic suspensions to show up the macro- and microstructure of steel specimens. This method has given valuable results in connection with the study of changes due to deformation and precipitation. It is especially useful as a means of studying the microstructure of stainless and heat-resisting steels. In 1933 the author suggested the use of γ-Fe_2O_3 + Fe_3O_4 suspensions in place of iron-powder suspensions in the magnetic method of detecting cracks. A simple magnetising apparatus, not requiring accumulators, and operating directly from the A.C. lighting mains, has been developed. Other new magnetic instruments include: (*a*) An instrument for the automatic recording of the preferred orientation in rolled steel—a record is obtained in 1 min.; (*b*) an instrument for recording magnetic changes during fatigue testing (in the course of a fatigue test the permeability passes through two peaks, the second occurring shortly before failure of the specimen); (*c*) a simple instrument to record the rate of transformation of the austenite on quenching at different temperatures (with the help of this instrument an accurate S-curve can be constructed in a day); and (*d*) simple magnetic instruments for measuring the thickness of corrosion-resisting coatings.

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Ca

The genesis of chemical reactions. N. S. Akulov. *Compt. rend. acad. sci. U. R. S. S.* 28, 135-8(1940)(in English).—In the usual theory of chem. reactions the following equation is written relating the velocity of reaction and the fraction of converted substance α, at time t: $d\alpha/dt = k\alpha(1 - \alpha)$, where k is the reaction const. In this paper the following more general equation is proposed: $d\alpha/dt = k(\alpha + (d\alpha/dt)t)(1 - \alpha)$. This equation leads automatically to an "induction period" and a crit. time when the reaction starts with a finite velocity. The results obtained from this more general equation agree well with data on different classes of reactions. E. G. T.

Inst. Chem., AS USSR
Inst. Physics, Moscow State U.

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COMMON ELEMENTS

Magnetic methods for the study of the structure of iron meteorites. N. S. Akulov and N. L. Bryukhatov. *Meteoritica, Acad. Sci. U.S.S.R.* 1, 23-31(1941); *Mineralog. Abstracts* 9, 203(1946).—The Boguslavka hexahedrite is a single crystal with strong magnetic anisotropy. Crocus powder in alc. is painted on the polished surface and allowed to evap. in a weak magnetic field perpendicular to the surface. This "magnetic suspension method" shows 3 types of structure: a granular structure at the exterior of the mass, followed by a lamellar structure, and at a depth of 2 cm. a uniform course block structure. This surface disturbance of the structure indicates sharp temp. gradients during the passage of the meteorite through the earth's atm. Many photomicrographs. M. F.

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MA

On the Velocity of Phase Transformations. N. Akulov (*Comp. Rend. (Doklady) Acad. Sci. U.R.S.S.*, 1941, (N.S.), 32, (5), 340–343).—[In English.] The theory of the speed of phase changes is discussed in general terms, particularly with reference to the effect of temperature. General equations are developed and discussed with regard to overheating and supercooling. Further applications are briefly indicated.—G. V. R.

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Bv. Abd

Theory of the autogenesis of chain reactions. N. S. Akulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, **39**, 204—208).—It is assumed that the average length of the reaction chain does not change in the course of the reaction and is $=1/(k\delta-1)$, δ being the probability of an active centre reacting with other mols., and k the no. of new centres created in this reaction. From these assumptions the main equations of chain processes, especially of explosion and flame reactions, are derived. J. J. B.

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The theory of combustion, inflammation and explosions. N. S. Akulov. *Doklady Akad. Nauk S. S. S. R.* 39, 239-43(1943); *Compt. rend. acad. sci. U. R. S. S.* 39, 224-7 (1943)(in English).—The math. methods, developed by A. for studying branched-chain reactions are applied to the detn. of the induction period of spontaneous ignition, inflammation and explosion as a function of pressure and temp. of gas mixts. A.'s theory accounts for the fact that an autogenetic reaction is not possible at all values of pressure and temp. The treatment developed by A. is shown to be capable of interpreting data on the oxidation of H_2S by O_2 (cf. *C. A.* 31, 4191[4], 7304[2]). It is also shown that the reaction rate is zero at the boundaries of the zone of autogenetic reaction. Cf. *C. A.* 25, 818[9]. J. W. P.

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The fundamental equation of the dynamics of phase transformations. N. S. Akulov. *Compt. rend. acad. sci. U. R. S. S.* 39, 268-71(1943); cf. *C. A.* 37, 2251[7](in English).—Math. treatment of the general problem of phase transformation leads to the following general equation of the *dynamics* of phase transformation: $\rho(da/dt) = Q\delta T/T_0) + (v_1 - v_0)\delta p$, where Q is the heat evolved in the conversion of the first phase into the second one (when $\delta p = 0$), v_i the sp. vol. of the i-th phase, $\delta T = T_0 - T$, i. e., the difference between the temp., T_0, at equil. and the temp. of the exaind. system of 2 phases, $\delta p = p - p_0$, i. e., the difference between the external pressure and the pressure at which T_0 has been detd., ρ the coeff. of internal resistance, which decreases with increasing temp. according to the equation: $\rho = \rho_0 e^{E/RT}$. For equil. conditions, the general equation given reduces to the well-known Clausius-Clapeyron equation. The newly derived equation is particularly useful in calcg. the max. *power* derived from a system undergoing a phase transformation and for investigating problems involving *quasi-stable states* undergoing a slow "aging" process. The possibility of using the general equation to develop a quant. theory of *steel tempering and quenching* and in explaining the phenomena of *glassy and amorphous states, e. g., in steel*, is pointed out.

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A-I-8

Diagram of the chemical activity of gases. N. S. Akulov (*Compt. rend. Acad. Sci. U.R.S.S.*, 1943, 39, 317—321).—Theoretical. The "passive" state of a chemically active gas, in which no spontaneous reaction occurs, may be divided into two types: (*a*) the state of "reaction damping," in which initiated reaction does not spread to the bulk of the gas, and (*b*) the state of "reaction spreading," where the zone of reaction spreads from the centre of initiation with a velocity w. An equation is derived connecting w and the pressure and temp. of a chemically active gas, and from this the boundary conditions between the states (*a*) and (*b*) can be calc. ($w = 0$). Experimental data on the reaction of CS_2 and O_2 agree with the theory. From an equation of similar type involving the induction period (τ) instead of w, the boundary conditions between state (*b*) and the state of autogenesis, in which reaction proceeds spontaneously after the lag τ, can be obtained ($\tau = \infty$). J. F. H.

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The role of catalysis in the process of self-ignition. N. S. Akulov. *Compt. rend. acad. sci. U.R.S.S.* 43, 301-5; *Doklady Akad. Nauk S.S.S.R.* 43, 317-21(1944). Math. Equations are developed which show the effect of a change in the ratio of the surface S of a neg. catalyst to the vol. of the reaction space. The scale of the boundary curve for the region of self-ignition along the axis of concns. increases proportional to $S^{3/2}/V^{3/2}$. In the case of neg. catalysis due to the walls of the reaction vessel, the scale is inversely proportional to the square root of the diam. of the vessel. The shifting of boundary curves along the temp. axis and the shape of theoretical boundary curves of the region of self-ignition are calcd. and agree quantitatively with expt. H. G. McCann

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The relation between the induction period and the chemism of a reaction. N. S. Akulov. *Compt. rend. acad. sci. U.R.S.S.* 48, 644-7(1945)(English summary).—Theoretical. An expression is derived for the induction period (τ) of reactions requiring a definite concn. of intermediate products before the reaction proceeds at a high velocity. τ is given as a function of temp., surface area, and adsorptive properties of the catalyst, vol., concn., and compn. The oxidation of H_2S is given as an example.
W. J. Kirkpatrick

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2

Shilov's theory of chain reactions and its further development. N. S. Akulov. *Compt. rend. acad. sci. U.R.S.S.* 49, 107-10(1945).—Math. Generalizations are developed for: (1) the relation for I from $I = -\Delta x/\Delta u$, where Δx is the increase in quantity of the end product and $-\Delta u$ is the decrease in quantity of the active product; (2) Shilov's equation of kinetics; (3) A.'s equation of autogenesis. Cf. *C.A.* 35, 2777[1]; 38, 6100[8]. Paul E. Clark

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CA

3

Determining conditions for self-induction of chain processes. N. S. Akulov. *Compt. rend. acad. sci. U.R.S.S.* 54, 411-14(1946)(in English); cf. *C.A.* 38, 6167[9].—Theoretical. A method, based on the theory of probability, is given for detg. the complex of parameters corresponding to the transition of a dying-out process into a self-inductive one. Weldon N. Baker

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USSR/Physics Sep/Oct 1947

Magnetization
Magnetism

2

"Mechanics of the Processes of Magnetization," N. S. Akulov, Scientific Research Institute of Physics, Moscow State University, 5 pp

"Izv Ak Nauk, Ser Fizich" Vol XI, No 5

Up to the present there has been very little data published on the effect of the interrelationship of magnetic domains on the path of the magnetization curve. The object of this article is to solve this problem and show that this interrelationship plays a most important role; which role is so great that in the pres-

LC 36783

USSR/Physics (Contd) Sep/Oct 1947

ence of strong fields, it is difficult to speak of individual boundaries of the domains. Discusses formulas for the calculation of the dimensions of the individual domains.

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USSR/Physics Sep/Oct 1947

Anisotropy

Ferromagnetism

3

"The Anisotropic Energy of Ferromagnetic Crystals of Binary Alloys," [redacted], I. M. Puzey, Scientific Research Institute of Physics, Moscow State University, 6 pp

"Izv Ak Nauk, Ser Fizich" Vol XI, No 5

The purpose of the article is to promulgate the data which was obtained as a result of the systematic study of parameter K_1 of magnetic anisotropy for binary alloys of Ni with nonferromagnetic impurities of various valencies, i.e., Ga, Sn, and Mo. Discusses the

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general objectives of the investigations which were conducted and lists the results obtained from the measurements which were conducted to determine saturation.

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AKULOV, N. S. PA 60194

USSR/Physics
Ignition
Diffusion

Jun 1947

"Role of Diffusion in the Auto-Ignition Process," N. S. Akulov, Act Mem, Acad Sci BSSR, 4 pp

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

Mathematical discussion concluding with theorem that diffusion leads to reducing the effectiveness of value of mathematical expectation of regeneration of A_{pp} upon quantity $\lambda_o D_p$; the coefficients of transmutation A_{pq} (with $p \neq q$ remaining invariable throughout).

[redacted]

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S6

539.374 : 538.221 : 548.572

547. **A new method of studying the plastic deformation of ferromagnetic crystals.** N. S. AKULOV AND N. Z. MIRYASOV. *J. Tech. Phys., USSR*, 18, 389-94 (March, 1948) *In Russian.*

The "deposition lines" on ferromagnetic crystals are connected in a definite way with the crystallographic directions. These lines also determine the degree and character of the residual stresses in the crystal and, consequently, enable the distribution of the latter to be referred to the crystallographic directions. The existence of two independent systems of deposition lines was proved, each of which characterizes a definite mechanism and degree of residual deformation. When the plastic deformation of the crystal is increased, qualitative and quantitative changes of the character of the deposition figures are found. The results of these observations make possible a systematic investigation of the magnitude of the plastic deformation for ferromagnetic mono- and polycrystals under a complex system of stresses. The new method was found to be much more sensitive and to supply a far more complete description of the plastic deformation quantitatively and qualitatively than any other method. B. F. KRAUS

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MA

On the Theory of Hysteresis Losses [of Cobalt] in Rotating Fields. N. S. Akulov and T. A. Elkina (*Doklady Akad. Nauk S.S.S.R.*, 1948, 59, (6), 1083–1080). [In Russian]. According to A.'s theory ("Ferromagnetism", Moscow, 1939), hysteresis losses in uni-axial ferromagnetic metals in fields of const. magnetic field intensity, H, rotating with respect to the specimen are 2·36 times larger than the losses in const.-direction alternating-intensity magnetic fields with an amplitude H, but also $\propto H^2$. Hysteresis losses were measured with the aid of a specially developed magnetometer on two Co specimens with identical magnetic properties (within 2%): (a) a 15-mm. dia., 0·5-mm.-thick disc, in 2·7 Oe. rotating const.-intensity fields, and (b) a 15-mm. long bar of 0·5 mm.² cross-sectional area, in alternating fields of 1·10 Oe. amplitude. In accordance with Rayleigh's laws, susceptibility was found to vary linearly with H ($\chi = \chi_0 + b_0 H$, where $\chi_0 = 1·6$ and $b_0 = 0·105$), and losses in alternating fields were found to follow Rayleigh's formula $W_{ab} = bH^3$, where $b = b_0$. Losses in weak rotating fields also followed the formula $W_{ab} = b_1 H^3$. The ratio b_1/b was found to be equal to 2·4 (±0·2), thus confirming Akulov's prediction. 10 ref. A.G.

Magnetic Lab.,
Inst. Physics, Moscow State Univ.

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N

1812. On the Diffusion of Transmuting Particles (O diffusii transmutiruyushchikh chastits) by N A Akulov Doklady Akad Nauk SSSR 61 235-238 (1948) July 11 (In Russian)

This is a continuation of a theoretical study outlined in Doklady Akad Nauk SSSR 56 No. 7 (1947) and in Vestnik Moskovskogo Univ No. 2 (1948). The case is investigated of particles diffusing into a substance and, through interaction with the latter, undergoing transmutation into particles with new properties. In the process of diffusion, the new particles may undergo further transmutations. Consecutive, cyclic, or chain types of processes are possible. The processes are viewed as diffusion waves transmuting into each other; a formula is derived giving the velocity of these waves.

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AKULOV, N. S.

Akulov, N. S., Blokhina, O.I., Bol'shova, K. M., and Chernova, A. P. Investigation of the constant of the anistropy of energy in triple alloys of the system Ni-Cu-Mo. P 855

The constant of anistropy for the triple system Ni-Cu-Mo changes as the amount of copper and molybdenum are increased.

Scientific Research Inst. of Physics, Moscow State University
July 7, 1948

SO: Journal of Technical Physics, (USSR) 19, No. 8 (1949)

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Chem. - 2

CA

Investigation of the energy anisotropy constants of ternary alloys of the system nickel-copper-molybdenum. N. S. Akulov, O. I. Blokhina, K. M. Bolshova, and A. P. Chernova (Univ. Moscow). *Zhur. Tekh. Fiz.* 19, 865-70 (1949); *Chem. Zentr.* 1950, II, 1323; cf. *C.A.* 42, 6592h.—In binary alloys of Ni with nonferromagnetic metals the energy anisotropy const. decreases rapidly with increasing electron concn. in the added metal, with the course of this decrease depending on the metal added. A study of the ternary system Ni-Cu-Mo within the range from 4 at. % Cu to 3 at. % Mo showed that the anisotropy const. depended only on the total concn. of valence electrons and was not a function of the particular metal furnishing the electrons. The empirical equation $k = \alpha(J_s)^3$, showing the relation between the anisotropy const. k and the magnetic satn. J_s, agrees quite well with exptl. results. M. G. M.

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5A

3970. **Magnetostriction of Fe-Pt alloys.** AKULOV, N. S., ALIZADE, Z. I. AND BELOV, K. P. *Dokl. Akad. Nauk, SSSR*, 68 (*No.* 6) 815–18 (1949) *In Russian.*—Three Fe-Pt alloys with 54, 56 and 58% Pt content, respectively, were prepared by smelting and drawn into wires which were tested for magnetostriction properties by a strain gauge method. By graphical integration of the test curves the value $\lambda_s \sim 105 \times 10^{-6}$ was obtained for the effect in the 54% Pt alloy. The effect was found to be > 2× the effect for Ni and positive, and was confirmed by the great magnetic sensitivity of the alloy to elastic deformations. Annealing the alloy at 740° after tempering at 900° considerably increases the effect, simultaneously raising the saturation value of magnetization (though less conspicuously). Annealing increases the electrical conductivity by 6%. B. F. K. (R)

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B

Law of Convergence to the Saturation Point in Polycrystalline Nickel. (In Russian.) N. S. Akulov and N. Z. Miryasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 29-32.

Indicates method of computation of coefficients in a formula formerly proposed by the senior author for the determination of differential sensitivity in polycrystalline ferromagnates, free of residual stresses. Calculated coefficients for different values of the variables correspond closely to experimental data. 11 ref.

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Ca

9

Theory of alloys. N. S. Akulov. *Doklady Akad. Nauk S.S.S.R.* **66**, 301-4(1940).—This is a math. treatment of the effect of order-disorder reactions on phys. properties, especially magnetic satn., J_s, and Curie temp., θ. Expressions for the magnetic moments of each kind of atom in the alloy are obtained by correcting the values for the pure metals for the effect of foreign neighbor atoms. From these expressions an equation for J_s is obtained additively which is found to agree with exptl. data on binary alloys such as Fe-Ni. The sum of the coeffs. of this equation equals the magnetic satn. of the second metal. If on the curve of J_s vs. the concn. of the second metal, C_2, a tangent is constructed at $C_2 = 0$, the segment ΔJ_s between the curve and the tangent at the concn. corresponding to an ordered structure is the increase in magnetic moment on ordering. This rule also holds for θ. Equations are given that make possible the calcn. of J_s for alloys of different types. A. G. Guy

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

"Biological Evolution as the Highest Form of Evolution of the Chain Processes," Dokl. AN SSSR, 68, No.1, 1949

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PROCESSES AND PROPERTIES INDEX

538.245

5A

A53
V

2500. **Theory of hysteresis loops.** N. A. AKULOV, O. S. GALKINA and V. I. IVANOVSKII. *Dokl. Akad. Nauk, SSSR*, 68 (*No.* 5) 833-6 (1949) *In Russian.*

Starting from the classical Rayleigh-Stoletov theory, the author derives an important relation between hysteresis losses and residual magnetization: $Q_h = 8I_rH_m/3$. The residual magnetization is given by $I_r = \frac{1}{2}bH_m^2 + \frac{1}{3}cH_m^3$. The experimental investigation was carried out on Fe-Co specimens on an Akulov-Bozorth magnetometer. Excellent agreement with theory was obtained.

H. P. KRAUS

ASM SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S. and VOLKOV, D. L.

"Precision Method of Measuring Magnetostriction," Vest. Mosk. un., 5, No.6, 1950

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

CA

9

The law of approximation to saturation in carbon steels. N. S. Akulov and K. M. Bol'shova. *Vestnik Moskov Univ.* 5, No. 9, *Ser. Fiz.-Mat i Estestven. Nauk* No. 6, 79–80 (1950).—The region in which tempered C steels approach satn. corresponds to the interval of fields 600–1500 oersteds and can be described by the formula: $x = (A/H^2) + (B/H^3) + x_0$. In this law the 1st term has a very high wt. for steels. In the tempered state the 1st term exceeds the 2nd by several times. This means that in the law for the approach to satn. for martensite, the term A/H^2 is of major importance. On the other hand, for homogeneous alloys, even in the cold-worked state, the term B/H^3 is of major importance in the law for the approach to satn. Another difference between the approach to satn. of C steels and homogeneous alloys is that for tempered martensite of high-C steels, the coeff. B has a neg. sign. The appearance of a neg. sign for B and a very large value of the coefficient A for martensite is explained by the action of strains within it. J. R. L.

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

"Anistropy of Magnetic Susceptibility of Silicon Iron Monocrystals in Weak Magnetic Fields," Zhur. Tekh. Fiz., 20, No.5, 1950

164153

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

CA

Application of the group theory to the analysis of crystal anisotropy. N. S. Akulov and Ya. I. Fel'dshtein (A. A. Zhdanov State Univ., Leningrad). *Doklady Akad. Nauk S.S.S.R.* 70, 503-6(1950); cf. *Z. Physik* 87, 768(1934); *C.A.* 28, 764.—For the derivation of the ferromagnetic properties of cubic and hexagonal crystals the tensor of anisotropy is defined and implicitly calcd. from a fundamental tensor-vector equation and the matrixes for the reflection and rotation symmetry operation of the groups. The conditions for isotropy and anisotropy are defined and explicitly discussed for cubic and hexagonal elementary cell operations. The calcns. are in a wider range also applicable to other phys. properties of crystals besides ferromagnetism and magnetostriction. W. E.

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

A55
V.

538.245 : 539.217

5153. The energy of activation in super-structure conversions. N. I. AKULOV AND E. N. SVERINA. *Dokl. Akad. Nauk, SSSR*, 70 (*No.* 5) 789-91 (1950) *In Russian.*

The mechanism of atomic diffusion, very important in the determination of the rate of super-structural conversions, may be of a dual kind: direct interchange of places between any 2 atoms, and "empty place diffusion," i.e. occupation of lattice nodes for any reason unoccupied. That the latter is the more probable process can be shown by quantum-mechanical calculations. The diffusion rate depends essentially on the height of the energetic barrier to be overcome by the atoms in the interchange or occupation of neighbouring vacuoles. Considerations of disorder-order and relaxation phenomena are further important factors, and it is here that difficulties arise for a number of alloys, mainly on the experimental side of the determination (usually X-ray or neutron scatter methods). The new theory of super-structural alloys shows that the variation of the magnetic moment is a linear function of the "nearest order of σ," σ being the degree of order. It can be shown that the magnetic saturation is in a quadratic relation to concentration and depends linearly on σ. This theory was applied to the investigation of annealed permalloy and the temperature-dependence of the magnetic moment enabled σ, τ and E to be determined where τ is relaxation time and E activation energy. The latter was found as 1·7 eV = 39 kgcal/mole. B. F. KRAUS

Evaluation B-78945

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

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CA

Law of approach to saturation for martensite. N. S. Akulov and K. M. Bol'shova (Moscow State Univ.). *Doklady Akad. Nauk S.S.S.R.* 71, 633-6(1950).—An exptl. study was made of the law of magnetic satn. of martensite in C steels. In the general case of nonequil., locally stressed, heterogeneous, ferromagnetic alloys, the law is $\chi = \chi_0 + A/H^2 + (B_0 + B' + B'')/H^3 + (C_0 + C' + C'')/H^4$ where χ is the magnetic susceptibility; χ_0, B_0, and C_0 are coeffs. in Akulov's theory for equil. metals (*Z. Physik* 60, 882(1931)); B' and C' are coeffs. detd. by the diffusion of internal stresses, and A, B'', and C'' are coeffs. detd. by local stresses and the presence of inclusions. The new exptl. method used a pulsating magnetic field that permitted amplification and increased sensitivity over the ballistic method. Steels contg. 0.49, 0.75, 1.03, 1.12, and 1.45% C were tested by being made the core of a transformer in the form of ellipsoids with 120- and 6-mm. axes. All specimens were water-quenched from the austenite region and were cooled in liquid N_2 to decomp. retained austenite. Specimens were also tested after 2-hr. tempering at 100, 150, 200, 250, and 350°. The field strength ranged from 600 to 1500 oersteds. The exptl. results were analyzed by using the equation, $\chi H^3 = AH + B$ and straight lines were obtained by plotting χH^3 against H. A increased with increasing C content to about 19 × 10^4 at 1.45% C in the quenched steels. On tempering A was almost unchanged to 100° but fell rapidly towards a value near zero as the temp. approached about 300°. B decreased in the quenched steel from 0 to −24 × 10^6 as the C content increased from 0.49 to 1.12%. On tempering up to about 250°, B increased and became pos. for all steels. Above this temp. B decreased but was still pos. at 350°. The diffusion of internal stresses cannot change the sign of B, but this change can be explained by the presence of sharp inhomogeneities in local internal stresses. Such stresses can cause the development of domains with antiparallel spins. The total magnetic field acting on such domains is the sum of the external field, H, and of the field, d, of the surrounding domains. Inhomogeneous stresses not only account for the appearance of the $1/H^3$ term, but also change the value and even the sign of the $1/H^3$ term. A. G. Guy

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

[Theory of chain reactions] Teoriia tsepnykh protsessov. Moskva, Gos. izd-vo tekhn.-teoret. lit-ry, 1951. 336 p. (MLRA 6:10)
(Chemical reactions)

B-80648, 24 Nov 54

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S., MARTN, I.P. FEIDCHTEIN, Ya. I.,

"Fatigue of Metals" Dok. Ak Nauk SSSR 11, May 1951 pp 263-266 U-1915

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

CA

Kinetics of the change in energy anisotropy in superlattice transformations. N. S. Akulov and E. P. Svirina. *Doklady Akad. Nauk S.S.S.R.* 76, 669-71(1951).—The dependence of the energy anisotropy const. K on the degree of order σ and on the duration of isothermal annealing at different temps. is detd. by studying the approach to satn. of alloys of the type $FeNi_3$ with different degrees of ordering. To the extent that the increase of magnetic satn. I_s is proportional to σ, $K = K_0(1 + a\sigma)^n$, where $K_0 = K_{\sigma=0}$, a is a const., the integer $n \geqslant 10$. This exptl. relation is explained by applying the theory of superlattice transformations; a similar expression is derived: $K_\sigma = K'_0(1 + a\sigma)^n$, where $K'_0 = K_1[(I_1 - b)/I_1]^n$, $a = b/(I_1 - b)$, and b is a const. If the annealing temp. T_a is near the crit. point of superlattice transformations, θ, then $n = 10$. For annealing at lower temps., however, the theoretical formula agrees with the exptl. one only for $n \gg 10$; this increase of n is not explained. Experimentally, n depends almost linearly on T_a, i.e., $n = 10 + n_0[1 - (T_a/\theta)]$, where n_0 is a const. The derived formula makes it possible to det. the change of the energy anisotropy for any annealing temp. and any duration when σ can be detd. from the theory of superstructure transformations.

Ellen H. Dunlap

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AKULOV, N.S.

Met (3)

Metallurgical Abst.
Vol. 21 Apr. 1954
Properties of Metals

Concerning the Fatigue of Metals. N. S. Akulov, I. P. Mazin, and Ya. L. Feldshtein (*Doklady Akad. Nauk S.S.S.R.*, 1951, 78, (2), 263-266).—[In Russian]. Some published empirical formulæ for interpreting fatigue data are discussed. Then, on the basis of a simple physical model of the formation of primary fatigue cracks, the relation $N = N_0 e^{-a(A - A_0)}$ is deduced for $A > A_0$, with $N \to \infty$ for $A \leqslant A_0$. In this expression, A is the amplitude of stress for fracture after N cycles, a is the const. of proportionality in the equation $dS = aSdA$ (where S is the general area of cleavage in unit vol. for one cycle) and A_0 the critical value of A at which cleavage begins. Published experimental data for C and alloy steels agree well with this formula.—O. V. E. T.

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AKULOV, N.S.

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CA

2

Diffusion of particles concomitant with chain reactions. N. S. Akulov, Yu. I. Rabinovich, and V. I. Skobelkin (M. V. Lomonosov State Univ., Moscow). *Doklady Akad. Nauk S.S.S.R.* 78, 1149-52(1951).—The system of equations for the concns. u_p for n types of particles undergoing diffusion and chem. transformation is of the form $\partial u_p/\partial t = D_p \Delta u_p + \sum_{q=1}^{n} a_{pq} u_q$, where $p = 1, 2 \ldots n$; this system is general, valid for any initial concns. and any diffusion coeffs. D. It is solved with the aid of the Fourier transformation pair $U_p(s, t) = [1/(\sqrt{2\pi})^3] \int_{-\infty}^{\infty} u_p(x, t) e^{isx} dx$ and $u_p(x, t) = [1/(\sqrt{2\pi})^3] \int_{-\infty}^{\infty} U_p(s, t) e^{-isx} ds$, where x, y, and s are three vectors. The functions $u_p(x, t)$ are given for the special case when all D are equal, and the case $D_i = D_j = D$, $u_{q_i} = u_{q_j} = u_q$, where $i, j = 1, 2 \ldots n$. General expressions for the rate of propagation of diffusion waves are derived for $D_i \neq D_j$, $i \neq j$. The limiting propagation velocity in chain-diffusion waves depends only on the phys. properties of the particles and of the medium and is independent of the order of the reaction.

N. Thon

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

CA

2

Dependence of the velocity of propagation of diffusion waves on the diameter of the channel. N. S. Akulov and V. I. Ivanovskii. *Doklady Akad. Nauk S.S.S.R.* 80, 773-6(1951).—In the special case when the concn. of active centers at the boundaries of a channel of circular cross section is zero, the differential equation for the concn. u of particles of one type is $\partial u/\partial t = D\Delta u + \alpha u$, with the boundary and initial conditions $u_{r=r_0} = 0$ and $u_{t=0} = f(r, z)$, and the integral $u = u_0(r, z)e^{\alpha t}$. On the assumption that at $t = 0$ the concn. of active centers is different from zero only in a very thin layer, the limiting velocity of propagation w at $t = \infty$ in a cylindrical tube of radius r_0 is $w = 2\sqrt{D[\alpha - (\mu_1^2/r_0^2)D]}$, and in a plane-parallel layer of thickness h, the velocity of propagation $w = 2\sqrt{D[\alpha - (\pi^2/h^2)D]}$. At a crit. $r_c = \epsilon\sqrt{D/\alpha}$, where ϵ depends on the shape of the reaction space, the diffusion wave cannot propagate. The calcn. is further extended to the case of several types of particles, with all D_i = const. = D. The limiting velocity is found to be $w_i = w = 2\sqrt{D[k^2 - (\epsilon^2/r_0^2)D]}$ where $\epsilon = \mu_1$ for a cylindrical tube, and $\epsilon = \pi$ for a plane-parallel layer. N. Thon

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

USSR/Physics - Ferromagnetic Materials Nov 51
Domains

"Concerning Eddy Microcurrents Arising in the Displacement of the Boundaries Between Domains," N. S. Akulov, Act Mem, Acad Sci Belorussian SSR, G. S. Krinchik

"Dok Ak Nauk SSSR" Vol LXXXI, No 2, pp 171-175

By analysis of the displacement of the boundaries between domains, derives formulas for skin effect at low and high frequencies. These formulas explain the drop in magnetic permeability at high,

USSR/Physics - Ferromagnetic Materials Nov 51
(Contd)

frequencies, and also establish the existence of anomalous eddy currents caused by special orientations of the shifting domain boundaries. Submitted 25 Jul 51.

199T102

AKULOV, N. S.

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S., KRINCHIK, G. S.

Electromagnetism

Properties of ferromagnetic materials in a dynamic system. Izv. AN SSSR. Ser. fiz. 16 No. 5, 1952.

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

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

USSR/Chemistry - Reaction Kinetics Jul 52

"For Advanced Tendencies in the Development of the Science of Chemical Reactions: Progress and Deficiencies in the Development of the Science of Chemical Reactions," N. S. Akulov, Moscow

Zhur Fiz Khim, Vol 26, No 7, pp 1040-1052

Condemns N. N. Semenov (who he declares merely continued the work of N. A. Shilov and D. V. Alekseyev) for making certain errors, as follows: (1) for reviewing the history of chain reactions in his writings; (2) not mentioning, and even concealing the fundamental, original, pioneering investigations of Shilov and Alekseyev; (3) giving credit to three foreign (non-Soviet) scientists, Bodenstein, Christiansen and Kramers for original basic work on the chain reaction theory, credit which he feels belongs to Shilov. Belittles Semenov's claim to certain scientific accomplishments, and points up Shilov's fundamental preeminence over Semenov. He quotes Lenin's vitriolic attack on P. M. Duhem's "Idealism" 25 years before, and condems Semenov for his defense (in 1934) of Duhem. Finally, he lists the names of Soviet scientists now working in the field of chain reactions (Tolstov, Frost, etc.) and praises their work. He refers to his own monograph (1951), "The

(2)

248T14

Theory of Chain Processes," and reviews its main parts. Then, in summarizing, he lists at length the many errors of Semenov. He also criticizes Ya. B. Zel'dovich, A. B. Nalbandyan, etc., and the quality of the work done by scientists of the Inst of Chem Physics, Acad Sci USSR, in general.

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248T14

PA 248T14

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

USSR.

*Kinetics of Superstructure Transformations in Alloys. N. S. Akulov and Ya. I. Fel'dshtein (*Doklady Akad. Nauk S.S.S.R.*, 1952, 82, (2), 221–223).—[In Russian] A. had previously shown (*ibid.*, 1949, 66, 361; *M.A.* 20, 630) that the change in magnetic moment of an alloy [illegible] ordering is a linear function of the degree of order (σ). Applying this theory to binary alloys, expressions are derived for the saturation magnetic moments of f.c.c. and b.c.c. lattices. The dependence of the paramagnetic susceptibility on σ is $\chi = \chi_0(1 + b\sigma)^n$. Putting $\sigma = \sigma_0(1 - e^{-\alpha t})$, $\sigma = 1 + b\sigma_0$, and $\beta = b\sigma_0$, this gives $y = \sqrt[n]{(\chi/\chi_0)} = \alpha - \beta e^{-\alpha t}$, or $\ln(\alpha - y) = \ln\beta - (t/\tau)$. Hence on plotting the experimental data as curves of $\ln(\alpha - y)$ against the time t, straight lines should be obtained, and the time of relaxation τ can be obtained from the slope. As an example, data obtained by Perekalina for the alloy CoMn at 300° C. have been plotted for $n = 1$ and $n = 2$; values of τ from these and from analogous curves for other temp. (T), have been plotted as graphs of $\log \tau$ against $1/T$. The relation is linear, whether n is taken as 1 or as 2 (because the experimental accuracy is insufficient). Using the relation $\tau = \tau_0 e^{W/RT}$, the energy of activation W is 16·7 kg.cal./mole for $n = 1$, and 15·4 kg.cal./mole for $n = 2$.

—G. V. E. T.

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

USSR/Physics - Coercive Strength, Magnetism 21 Mar 52

"Certain New Laws Relating the Magnitude of Loss to the Coercive Force," N.S. Akulov, Act Mem, Acad Sci Belorussian SSR, T.A. Yelkina

"Dok Ak Nauk SSSR" Vol 83, No 3, pp 377-379

Shows that one can establish for the region of inversion a new and more general law which connects loss with other magnetic characteristics. States that earlier Rayleigh had established empirical laws for magnetism and hysteresis in weak magnetic fields, these laws being theoretically founded on modern representations

227T66

concerning the nature of magnetism. Later other connections were established; e.g., with hysteresis. Submitted 22 Jan 1952.

227T66

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

CA

Theory of the three explosion limits. N. S. Akulov. *Doklady Akad. Nauk S.S.S.R.* 83, 427-30(1952).—If the 3rd explosion limit were of thermal nature, its line should not intersect that of the 2nd limit, which it does. This fact is contrary to Semenov's attribution of the 3rd limit to energy chains. Actually, the 3rd limit follows from the author's equation, $\sum_n(-1)^n a_n \rho^n = 0$, with $n = 0, 1, 2, 3$, where ρ = pressure, and the coeffs. $a_n > 0$ are functions of the temp. T, the concn. γ of O_2, and the diam. $2R_0$ of the vessel. This equation fits the data on the $H_2S + O_2$ reaction. The 3rd limit thus appears to have a fundamental significance, whereas the "peninsula" represents an anomalous region, due to effects of the walls of the vessel. For the above equation to have 3 pos. real roots, it is necessary that $q = a_1a_2/a_0a_3 > 9$. This criterion serves as a guide in the choice of the chain scheme for a given combustion reaction. As an example, in the $H_2S + O_2$ reaction, possible free radicals are H, S, O, OH, OS, SH, etc. A variety of possible branching-chain schemes can be set up with these radicals. The true scheme of the reaction is that for which the max. root k_m of the characteristic equation is max.; that scheme predominates over all the other competing paths.

N. Thon

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

USSR/Physics - Plastic Deformation 21 Apr 52

"Magnetization Curve of Plastically Deformed Iron in Strong Fields," N. S. Akulov, Act Mem, Acad Sci Belorussian SSR K. M. Bol'shova, Sci Res Inst of Phys, Moscow State U imeni Lomonosov

"Dok Ak Nauk SSSR" Vol LXXXIII, No 6, pp 817-819

The term A/H^2 is experimentally observed in the law governing the approach to satn, besides the usual terms. W. F. Brown was the 1st to attempt a theoretical explanation of this term (Phys Rev, 58, 736, 1940; 60, 139, 1941). Discusses attempts to test subject theory on plastically deformed

223T89

materials that possess anisotropy parameters different from nickel's: armco iron and the alloy Fe-Mo with 4% molybdenum. Submitted 21 Feb 52.

223T89

AKULOV, N. S.

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

Modern theory of the chain reactions. Izv. AN BSSR no. 4:55-62 Jl-Ag '53. (MLRA 9:1)

1. Deystvitel'nyy chlen Akademii nauk BSSR.
(Chemical reactions)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S. Prof. and KRINCHIK, G. S. Engr.

"The Theory of Ferromagnetic Phenomena in Dynamic Systems," a paper given at the All-University Scientific Conference "Lomonosov Lectures", Vest. Mosk. Un. No.8, 1953.

Translation No U-7895, 1 Mar 56

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S., professor; KHIMCHENKO, N.V., kandidat tekhnicheskikh nauk

Effect of temperature on the corrosion of steel and cast iron by acidic substances. Sbor.st. NIIKHIMMASH no.14:117-123 '53. (MLRA 7:11)

1. Deystvitel'nyy chlen Akademii nauk BSSR (for Akulov)
(Steel--Corrosion) (Cast iron--Corrosion)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

Theory of chain reactions in the calculation of diffusions of active centers. Zhur.eksp. i teor.fiz. 24 no.4:494-500 Ap '53. (Chemical reactions) (Diffusion) (MLRA 7:10)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

USSR/Chemistry - Combustion of Gases

"Concerning the Role of Positive-Negative in Phenomena of the Spontaneous Ignition Mixtures," N.S. Akulov, Moscow State Univ

Zhur Fiz Khim, Vol 27, No 5, pp 771-774

Reference is made to previous work showing solid catalyst can increase the rate of re a gas mixt under some pressures and decrea rate under other pressures (positive-negat alysis). An example of chain process is us show that catlysis is negative under low p and positive under high pressures. The aut onstrates mathematically that the effect of

catalysis can lead to the emergence of thre of spontaneous ignition. Using the reactio O_2, the author brings out that the theory o neg catalysis for this raction is in good ag ment with extensive exptl data.

2

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

USSR/Chemistry - Chain Reactions, Apr 53
Atomic Energy

"The Theory of Chain Reactions in the Calculation of the Diffusion of Active Centers," N. S. Akulov

Zhur Fiz Khim, Vol 27, No 4, pp 614-615

In all chain reactions which occur in nature, diffusing active centers interact with the medium, forming active centers of another type. The view of V. V. Voyevodskiy and A. S. Kompaneyets (Zhur Eksp i Teor Fiz, Vol 23, p 229, 1952) that there is only one type of active center in the chain fission of U, i.e. the neutron, is erroneous. One must consider

270T23

at least 2 types of centers, i.e. slow and fast neutrons. Although Voyevodskiy and Kompaneyets use with small changes equations developed in the author's (Akulov's) book, they claim credit for independent work in arriving at the same result as the author.

270T23

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.
~~Alekseyev~~, ~~D.~~ V.

USSR/Chemistry - Reaction Kinetics, Theory of Chain Reactions

Jul 53

"N. A. Shilov's and D. V. Alekseyev's Theory of Chain Reactions," N. S. Akulov

Zhur Fiz Khim, Vol 27, No 7, pp 1111-1132

In view of the fact that the theory of chain reactions has proved of great value in the field of kinetics of combustion and explosion and, since 1939, in work on nuclear energy, accurate knowledge of its origin and development is essential. Until 1944, N. N. Semenov was regarded as the founder of this

271T18

theory both in the USSR and abroad. In 1944 the author (N. S. Akulov) gave due credit to N. A. Shilov (1905) and D. V. Alekseyev (1915), on whose results N. N. Semenov's work is based to a large extent.

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A. V. Gheremushkina, Dokl[illegible]
no. 1, Sept. 1, 1954, p. 35-38.
Equations expressing relations of uneven effects to magnetic [illegible]

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

USSR/Physics - Hall's effect

Card 1/1 : Pub. 22 - 9/44

Authors : Akulov, N. S., active member of the Acad. of Scs. of the BSSR; and Cheremushkina, A. N.

Title : Regarding the Hall effect theory in ferro-magnetics

Periodical : Dok. AN SSSR 98/1, 35-38, Sep 1, 1954

Abstract : It is suggested that the Hall thermomagnetic effect, described by the following formula:

$$R_0 - R_T = C(I_{sT}^2 - I_{s0}^2),$$

be evaluated by Akulov's formula:

$$e = \left[a_0 \rho_0 + a_2 (\rho T - \rho_0)\right] I_s i$$

which is a more general formula, but gives the same results. Symbols are explained. Six references (1930-1952). Graphs.

Institution : Moscow State University im. M. V. Lomonosov

Submitted :

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

Akulov, N.S.

USSR/ Physics - Hall's effect

Card 1/1 Pub. 22 - 11/49

Authors : Akulov, N. S., Active Memb., Acad. of Scs., BSSSR; and Cheremushkina, A. V.

Title : On the influence of the arrangement on Hall's effect in electromagnets

Periodical : Dok. AN SSSR 102/1, 45-47, May 1, 1955

Abstract : The manner in which the degree of magnetization affects the Hall's effect in ferro-magnets is considered and some theories connected with the variations of Hall's effect in ferro-magnets and outlined. Results of experimental work, intended to prove or disprove the above mentioned theories, are pointed out. Nine references: 1 USA and 8 USSR (1930-1954). Graph.

Institution : .....

Submitted : November 11, 1954

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

Akulov, N.S.

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D.S. Alpha, Jr.

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sharp transition, and already in the "elastic" domain there

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AKULOV, N. S.

Theory of explosion processes. N. S. Akulov. *Doklady Akad. Nauk S.S.S.R.* 104, 376-9(1955). An exponential increase in chain-reaction velocities is characteristic for linear chain reactions. Entirely different kinetic equations are derived for nonlinear chain reactions (*Zhur. Eksptl. i Teoret. Fiz.* 24, 494(1951)). Two limiting cases, differing in principle, are discussed: (a) autocatalysis and (b) explosion autogenesis, which differ in that the velocity in b increases suddenly in 10^{-3} sec. or less. An equation is derived for the sudden velocity jump after some incubation period, the jump being the greater, the longer the incubation period.

W. M. Sternberg

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

B-5

USSR/ Physical Chemistry - Crystals

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 11051

Author : Akulov N.S.
Inst : Academy of Sciences USSR
Title : On the Theory of Atomic Magnetic Moments in Ferromagnetics

Orig Pub : Dokl. AN SSSR, 1955, 105, No 5, 935-938

Abstract : The author attempts to determine the magnetic moments of ferromagnetic alloys, applying the theory of distribution of electrons in 3d- and 4s-shells of ferromagnetic atom (Akulov N.S., Kakushadze T.I., Dokl. AN SSSR, 1951, 77, No 4) to the region of low temperatures. Having determined from experiments the constant correlated with the interaction, the author derives linear dependencies of magnetic moments on density of 3d and 4s-electrons: for atoms having a stable group of electrons with parallel spins $\mu = \mu_B (11.59 - 1.0984n)$, for atoms with a stable group of antiparallel spins $\mu = \mu_B (n - 5.776)$. By means of these formulas magnetic moments of alloys can be determined with satisfactory accuracy.

Card 1/1

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S. (Moscow)

"A New Method of Calculating Monocrystals Magnetistriction," a paper submitted at the International Conference on Physics of Magnetic Phenomena, Sverdlovsk, 23-31 May 56.

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

USSR/ Physics

Card 1/1 Pub. 22 - 8/43

Authors : Akulov, N. S.

Title : A theory of magnetostriction of monocrystals (Ni)

Periodical : Dok. AN SSSR 106/1, 31-34, Jan 1, 1956

Abstract : A theory is presented of the magnitostriction of monocrystals of the Ni type (crystals with 8 directions). The theory is based on the law of anisotropy. In accordance with this law a formula for calculating magnetostrictions was derived. Magnetostriction calculated by this formula is in good agreement with experimental data. Five references: 2 USSR (in German), 2 Germ., 1 Jap. (1928-1933). Graphs; diagram.

Institution : .....

Submitted : April 21, 1955

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1367
AUTHOR AKULOV, N.S.
TITLE The Theory of Ferro-, Para- and Ferri-Magnetism.
PERIODICAL Dokl.Akad.Nauk, 108, fasc. 4, 603-606 (1956)
Issued: 8 / 1956 reviewed: 10 / 1956

On the basis of the formula for the atomic magnetic moment in the paramagnetic state $\mu_p = \mu_B \sqrt{2S_p(2+2S_p)}$ it is possible to construct a diagram for $S_p(n)$, the elements of which consist of sections of straight lines in the ferromagnetic and in the paramagnetic domain. Such a diagram, in contrast to the diagram by SLATER and PAULING, makes it possible to set up a general rule for the coupling of atomic moments above and below the CURIE point. The theory to be developed is based upon the capture of s-electrons by d-electrons at the expense of exchange energy. By an increase of accuracy on the occasion of the computation of capture probability it is possible to determine the magnetic moments of the atoms above and below the CURIE point. For the computation of the probability of the transition of the second s-electron into the d-shell, the numbers n''_d and n'_d of the "left" and "right" spins respectively must be ascertained, and from them ds-interaction is determined. For the Cr-atom it is true that $n'_d = 5$ and $n''_d = 0$, and for the transition probability of the second electron into the d-zone with $T < \Theta$ we find the relation $\Delta n''_d = \alpha(n - 6)$. Here α is a proportionality coefficient. (T, Θ denote temperatures).

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Akulov, N.S.

USSR/Theoretical Physics - General Problems. B-1

Abs Jour : Referat Zhur - Fizika, No 1, 1958, 156

Author : Akulov, N.S.
Inst : -
Title : Causal Interprepation of the Occurrence of Elementary Discharges and Their Electromagnetic Fields.

Orig Pub : Tr. Mosh. in-ta khim. mashinostr., 1957, 12, 133-139

Abstract : The author starts with the concept that the space is filled with neutral particles ("rheons"), which are located discretely at distances $r_0 \approx 10^{-13}$ cm from each other. Each rheon consists of a virtual electron and positron. Under the influence of the energy quanta, there occur elastic displacements of these virtual particles, and this explains pair production and the occurrence of the electromagnetic field. From this derives the equations of Maxwell and the Lorentz transformations.

Card 1/1

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AUTHOR AKULOV, N.S. PA - 2246

TITLE On the Note of W.F.BROWN jun., concerning the Theory of the Magnetostriction of Nickel Single Crystals (Po povodu zametki U.F.BRAUNA, k teorii magnitistriktsii monokristallov nikelya).

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 112, Nr 5, pp828-830 (U.S.S.R.)
Received 4/1957 Reviewed 4/1957

ABSTRACT The computations carried out by GANS and HARLEM actually contain an error and the author thanks Mr.BROWN for drawing attention to this fact. According to the author's opinion, however, this mistake is in no way connected with the author's theory and his computations. The objections against the theory used by HEISENBERG are, on the contrary, maintained even if BROWN's corrected computations are used as a basis. In the paper of GANS and HARLEM the basic formulae given by the author are correctly applied. The mistake which they themselves admit is rather connected with the incorrect application of HEISENBERG's method, and this confirms the fact that the application of this method is not always easy. Though the formula of BROWN basing on a more correct application of HEISENBERG's method agrees better with the experiment than the curve of GANS and HARLEM, the theoretical curve obtained by the author's energetic method nevertheless describes experimental data better than BROWN's formula. According to the author's opinion agreement of the curve given by him with experimental data is difficult to explain by experimental errors (This surely is a contradiction in itself, reviewer's note). But

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N. S.

"The Dispersion of Ultrasound in Ferromagnetic Materials"

report presented at the 6th Sci. Conference on the Application of Ultrasound in the Investigation of Matter, 3-7 Feb 1958, Organized by Min of Education RSFSR and Moscow Oblast Pedagogic Inst. im N. K. Krupskaya.

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

24(1) PHASE I BOOK EXPLOITATION SOV/3150

Vserossiyskaya konferentsiya professorov i prepodavateley pedagogicheskikh institutov

Primeneniye ul'traakustiki k issledovaniyu veshchestva; trudy konferentsii, Vyp. 7 (Application of Ultrasonics for Analysis of Substances; Transactions of the All-Russian Conference of Professors and Teachers of Pedagogical Institutes, Nr 7) Moscow, Izd. MOPI, 1958. 283 p. 1,500 copies printed.

Tech. Ed.: S. P. Zhitov; Eds.: V. P. Nozdrev, Professor, and B. B. Kudryavtsev.

PURPOSE: This book is intended for physicists, technicians, aeronautical engineers and other persons concerned with ultrasonics.

COVERAGE: The book contains twenty eight articles which treat ultrasonic phenomena in five general categories: 1) historical data on the development of ultrasonics in the Soviet Union over the past forty years; 2) the speed of sound in suspensions of varying concentration and number and type of components and the relationship between sound velocity and the compressibility of electrolytes; 3) ultrasonic investigations of physical and chemical properties of materials and the determination of physical and chemical constants, e. g. density of aqueous solutions, adiabatic compressibility, molarity of solutions (with given temperatures), viscosity, surface tension, saturation pressure and also ultrasonic investigation of the carbon content and petrographic state of coal; 4) industrial applications of ultrasonics, e. g. emulsification of reagents, cleansing of textile fibers and enhancing the susceptibility of some synthetic fibers to dyeing, etc.; and 5) apparatus which produce ultrasonic waves. No personalities are mentioned. References accompany each article.

Yagorov, N. N. Application of Ultrasonic Methods for Measurement of the Depth of a Tempered Surface Layer 169

Yakovlev, V. F. and A. D. Zipin. Elementary Theory of a Quartz Converter 185

Kal'yanov, B. I. Measurement of the Coefficient of Absorption of Ultrasound in the Critical Range of Methyl Acetate by the Pulse Method 201

Kal'yanov, B. I. Methodological Peculiarities of Investigating the Coefficient of Absorption of Substances in the Critical Range by the Pulse Method 207

Sobolev, V. D. The Application of a Telescopic System for Measurement of the Speed of Ultrasound by the Optical Method 217

Bormosov, Yu. N. and O. A. Starostina. A New Design for the Measuring Chamber of a Photoelectric Apparatus 221

Maksimov, Ya. S. and A. I. Ivanov. A Demonstrator Pulse Generator With Ultrasonic Indicator 225

Mel'nikov, A. S. Some Academic Experiments With the Application of Electroacoustic Apparatus 229

Kudryavtsev, B. B. The Propagation of Sound in Liquids 257

Belinskiy, B. A. The Theory of Speed Dispersion and the Coefficient of Absorption of Ultrasound in Esters of Organic Acids 269

Akulov, N. S. The Theory of Phase Transitions With Two Curie Points 279

Card 6/7

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

On the theory of seignettoelectric substances. Dokl. AN BSSR 2 no.9:365-369 O '58. (MIRA 12:7)
(Ferromagnetic substances)

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"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

24 (3)

AUTHORS: Akulov, N. S., Cheremushkina, A. V. SOV/56-35-2-36/60

TITLE: On the Hall Effect in the Curie Point (Ob effekte Kholla v tochke Kyuri)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 2 (8), pp 518-519 (USSR)

ABSTRACT: In the temperature interval which is noticeably higher than Curie (Kyuri) point magnetization is caused by a variation of the number of the parallel and of the antiparallel spins. In this case there is no short-range order. The authors use for this process the term "real magnetization" in order to distinguish it from the paraprocess which corresponds to the existence of a short-range order and to the formation of micro-domains. The paraprocess causes a magnetization by turning the microdomains. These two processes and also the processes of inversion (the sudden jump of the vector of spontaneous magnetization from one direction of easy magnetizability to another) and rotation (the egress of the vector of the spontaneous magnetization of the domain from the direction of the easy magnetizability) corresponds to its characteristic Hall (Kholl) parameter. The following

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results were obtained for the inversion: In the range of technical saturation, the Hall electromotive force in iron- aluminium alloys depends on the magnetization I in a non-linear manner. For alloys with a non-zero anisotropy constant there is an inflection in the region of the transition from the inversion to the rotation. A sharp difference between the Hall parameters of the paraprocess and of the real magnetization was observed. The ferromagnetic Hall parameter of the real magnetization is practically equal to zero. According to these results, the distribution of the spins does not imply a Hall effect if there is no short-range order (even if $I \neq 0$ provided that $H \neq 0$). By approximation to the Curie point a short-range order arises which may be characterized by the formation of microdomains (i. e., of electron complexes with parallel spins). The higher the number of these microdomains, the higher the value of the ferromagnetic Hall (Kholl) parameter R. The curve R(T) above the Curie point may be considered to be a characteristic of the probability of the generation of micro-domains at different temperatures. Below the Curie point the microdomains fuse and form larger complexes, i. e. domains. A formula is given for the

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dependence of the Hall parameter on the temperature below the Curie point. This formula implies the existence of 2 effects one of which is proportional to the specific electric resistance ρ and the other - to ρ^2. Finally the authors demonstrate that some previous results of other authors are special cases of the results deduced in this paper. There are 2 figures and 6 references, 5 of which are Soviet.

ASSOCIATION: Moskovskiy geologorazvedochnyy institut (Moscow Geological Prospecting Institute)

SUBMITTED: April 18, 1958

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

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SOV/142-2-3-26/27

9(3,9), 24(1)

AUTHOR: Sokolova, Ye.S., Candidate of Technical Sciences

TITLE: A Scientific Conference on the Application of Ultrasound in the Investigation of Matter

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1959, Vol 2, Nr 3, p 386 (USSR)

ABSTRACT: From February 10-14, 1959, the Seventh Scientific Conference on the Application of Ultrasound for the Investigation of Matter was convened in Moscow at the Moskovskiy Oblast'noy pedagogicheskiy institut, imeni N.K. Krupskoy (Moscow Oblast Pedagogical Institute, imeni N.K. Krupskaya). About 500 vuz instructors from Moscow, Leningrad, Krasnoyarsk, Kaunas, Stalingrad, and scientists from the German Democratic Republic and Poland participated in the conference work. More than 80 papers were read at the conference. The following sections were organized at this conference: molecular acoustics, industrial application of ultrasound research methods, propagation of ultrasound in solid bodies, demonstration of acoustical phenomena in schools and vuzes. At the first plenary session, the paper of V.F. Mozdrev was read "Physical Principles of Tech-

Card 1/3

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"nological Application of Low-Amplitude Molecular Acoustics". B.B. Kudryavtsev read his paper "The Application of Ultrasound in Industry". The following papers were read at the plenary session: A.S. Predvoditelev "The Sound Wave Dispersion in Rarefied Gases"; Dr. Rothard, German Democratic Republic, "Ultrasonic Investigation of Silica Gel and Its Derivatives"; M. Kyek, Poland, "The Application of the Molecular Kinematic Theory of Gases to the Problem of Waves with a Limited Amplitude"; V.S. Akulov, "The Theory of Rochell-type Salts", and a paper of Professor F. Kucher, Poland. Research in the field of ultrasound wave propagation in liquids was the subject of the papers of B.B. Kudryavtsev, S.A. Dalyan, L.G. Belinskaya, O.A. Karostina, V.M. Zakurenova, V.D. Kaspar'yants, M.G. Shirkevich, L.F. Vereshchagina, N.L. Bryukhatova, and N.A. Golosova. The paper jointly produced by B.B. Kudryavtsev, V.F. Mozdrev, N.I. Koshkin and V.F. Yakovlev was devoted to the consideration of problems in the development of molecular acoustics. Dr. Rothard delivered a report on the dynamic equation of the state of strongly viscous liquids. The ultrasonic oscillations were subject of the reports of Yu.M. Dystrov, A.N. Trofimov, A.I.

Card 2/3

Ryazanov, L.E. Pirozhnikov, L.F. Lependin, F.L. Lokshin, I.L. Cherchenko and others. The report of L.A. Ol'shanskiy, A.V. Mordvintseva and others dealt with the application of ultrasound in welding. In the sections of acoustic research methods, the papers of the following authors were read: D.I. Kal'yanov, V.F. Yakovlev, A.B. Kipir and V. Kovaleva. These reports dealt with pulse measuring methods of velocity and absorption of ultrasound. The propagation of ultrasound in solid bodies was the subject of the reports of I.G. Merkulov, V.S. Cherkashin, L.A. Yakovlev, A.I. Drokin, A.K. Matveyev and others. In the section dealing with acoustical demonstration at schools and vuzes, the following reports were delivered: M.A. Grabovskiy and V.P. Topolev, "Experimental Demonstration of Ultrasound"; N.I. Mel'nikov, "The Experimental Demonstration of Sound"; S.N. Prokof'yev, "An Acoustic Radiometer for Demonstration Purposes". The annual conference convened at MOPI showed the rising interest in problems of applying ultrasound to the investigation of matter. The number of participants and the number of subjects is rising steadily.

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SUBMITTED: April 13, 1959

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.; FRANYUK, V.A.

Changes in some physical properties of metals during fatigue. Dokl.AN BSSR 3 no.3:87-90 Mr '59. (MIRA 12:8)
(Metals--Fatigue)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.

Shape of the hysteresis loop of polycrystals. Dokl. AN BSSR 3 no.7: 294-297 Jl '59. (MIRA 12:11)
(Crystals) (Hysteresis)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

AKULOV, N.S.; FRANYUK, V.A.

Statistical theory of the fatigue disintegration of metals. Dokl. AN BSSR 3 no.8:331-335 Ag '59. (MIRA 12:11)
(Metals—Fatigue)

APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2"

"APPROVED FOR RELEASE: 06/05/2000 CIA-RDP86-00513R000100720018-2

24(3) SOV/56-36-4-18/70

AUTHOR: Akulov, N. S.

TITLE: On the Theory of the Polarization Curves of Seignette Electrics (K teorii krivykh polyarizatsii segnetoelektrikov)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 4, pp 1085-1087 (USSR)

ABSTRACT: The present theoretical paper is intended to make a contribution towards the polarization theory for single- and many-domain Seignette-electric crystals in weak, medium, and strong fields. As already shown by the author in 1933 (Ref 1), the magnetization curve theory is unsatisfactory in principle as well as in practice. It is possible, by means of the theory of the electrization curves, to develop a new theory of coercive force and its temperature dependence. This theory deviates essentially from the one-domain theory. The present paper makes a contribution by a theory of the susceptibility $\varkappa$. In view of the existence of the processes of rotation, inversion, and of the paraprocess $\varkappa = \varkappa_r + \varkappa_i + \varkappa_p$ is set up. $\varkappa_r$ can in first approximation be neglected for Rochelle salt. The calculation $\varkappa_i$ and $\varkappa_p$ for

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various temperatures is carried out according to the electrization equation (Ref 3) $E = -a(T-\theta_1)^{\nu} (\theta_2-T)^{\mu} P+BP^3+CP^5$; P = polarization, E = electric field strength, θ_i = the Curie points, a and B = parameters, ν and μ integers. For only one Curie point $\mu = 0$. For the energy of the domain U it holds in dependence on the position of the domain boundaries that $U_i = x^2P(c_1\sigma + c_oP)$, where x denotes shifting of the domain boundaries from the position of equilibrium and σ the internal electric voltage. Further, $E = x(c_oP + c_1\sigma)$, and for the initial dielectric susceptibility one obtains $\varkappa_i = 2nxP/E$, where n is the number of plane domains in 1 cm^3. Herefrom follows $\varkappa = 2nc_o'$ $c_o' = P/(c_oP + c_1\sigma)$, i.e. $\varkappa_i$ at $\sigma \to 0$ does not depend on temperature. For weak fields ($E = 0$) $\varkappa_p = dP/dE = 1/2A$ and at $\nu = \mu = 1$ $\varkappa = \varkappa_o + 1/2a(T-\theta_1)(\theta_2-T)$, $\varkappa_o = \varkappa_i + \varkappa_r$. For strong fields it holds at $\nu = \mu$ and $\theta_1 < T < \theta_2$ and $c = 0$

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SOV/56-36-4-18/70

On the Theory of the Polarization Curves of Seignette Electrics

$\chi' = P/E = 2\sqrt{(T-\theta_1)(\theta_2-T)}/E(\theta_2 - \theta_1)$. χ' denotes susceptibility in the absence of rotation- and inversion processes. For polarization it holds that $P = (E/B)^{1/3}$. A comparison of the theoretically obtained dependence $E_c(T)$ between θ_1 and θ_2 shows good agreement with the curve experimentally obtained by Bradford (Fig 3). There are 3 figures and 4 Soviet references.

SUBMITTED: June 6, 1958

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AKULOV, N. S.

PHASE I BOOK EXPLOITATION SOV/4893

Vsesoyuznoye soveshchaniye po fizike, fiziko-khimicheskim svoystvam ferritov i fizicheskim osnovam ikh primeneniya. 3d, Minsk, 1959

Ferrity; fizicheskiye i fiziko-khimicheskiye svoystva. Doklady (Ferrites; Physical and Physicochemical Properties. Reports) Minsk, Izd-vo AN BSSR, 1960. 655 p. Errata slip inserted. 4,000 copies printed.

Sponsoring Agencies: Nauchnyy sovet po magnetizmu AN SSSR. Otdel fiziki tverdogo tela i poluprovodnikov AN BSSR.

Editorial Board: Resp. Ed.: N. N. Sirota, Academician of the Academy of Sciences BSSR; K. P. Belov, Professor; Ye. I. Kondorskiy, Professor; K. M. Polivanov, Professor; R. V. Telesnin, Professor; G. A. Smolenskiy, Professor; N. N. Shol'ts, Candidate of Physical and Mathematical Sciences; E. M. Smolyarenko; and L. A. Bashkirov; Ed. of Publishing House: S. Kholyavskiy; Tech. Ed.: I. Volokhanovich.

PURPOSE: This book is intended for physicists, physical chemists, radio electronics engineers, and technical personnel engaged in the production and use of ferromagnetic materials. It may also be used by students in advanced courses in radio electronics, physics, and physical chemistry.

COVERAGE: The book contains reports presented at the Third All-Union Conference on Ferrites held in Minsk, Belorussian SSR. The reports deal with magnetic transformations, electrical and galvanomagnetic properties of ferrites, studies of the growth of ferrite single crystals, problems in the chemical and physicochemical analysis of ferrites, studies of ferrites having rectangular hysteresis loops and multicomponent ferrite systems exhibiting spontaneous rectangularity, problems in magnetic attraction, highly coercive ferrites, magnetic spectroscopy, ferromagnetic resonance, magneto-optics, physical principles of using ferrite components in electrical circuits, anisotropy of electrical and magnetic properties, etc. The Committee on Magnetism, AS USSR (S. V. Vonsovskiy, Chairman) organized the conference. References accompany individual articles.

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17. AKULOV, N.S

PHASE I BOOK EXPLOITATION SOV/5488

Moscow. Vsesoyuznyy nauchno-issledovatel'skiy i konstruktorskiy institut khimicheskogo mashinostroyeniya.

Materialy v khimicheskom mashinostroyenii (Materials in Chemical Machine Building) Moscow, Informatsionno-izdatel'skiy otdel, 1960. 143 p. (Series: Its: Trudy, vyp. 34) 3,000 copies printed.

Sponsoring Agency: Gosudarstvennyy komitet Soveta Ministrov SSSR po avtomatizatsii i mashinostroyeniyu and Vsesoyuznyy nauchno-issledovatel'skiy i konstruktorskiy institut khimicheskogo mashinostroyeniya NIIKhIMMASh.

Ed. (Title page): V. K. Fedorov, Candidate of Technical Sciences; Editorial Council: Chairman: V. B. Nikolayev; Deputy Chairman: Yu. M. Vinogradov, Candidate of Technical Sciences; B. N. Borisoglebskiy, A. N. Goncharov, Yu. G. Popandopulo, I. N. Yukalov, Candidate of Technical Sciences, and G. M. Yusova, Candidate of Technical Sciences; Ed.: V. I. Glukhov; Tech. Ed.: P. A. Vshivtsev.

PURPOSE : This collection of articles is intended for technical personnel in chemical machine building and other branches of the machine and instrument industry.

COVERAGE: The collection deals with the results of investigations on the mechanical, corrosive, and engineering qualities of certain alloys. Also discussed are heat-treatment regimes, the phase composition of stainless steels, methods of checking products, and new designs of apparatus used in checking. References accompany each article.

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Contents in Kh18N12M3T Steel on Their Formability [Engineers A. P. Golovanova, L. L. Kravchenko, V. N. Dyatlova, and Candidate of Technical Sciences A. P. Akshentseva took part in the investigation] 82

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ACCESSION NR: AR3001637 S/0137/63/000/004/I115/I115

SOURCE: RZh. Metallurgiya, Abs. 4I653

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AUTHOR: Yesilevskiy, V. P.; Akulov, N. S.

TITLE: The pondermotive magnetic method of determining the percentage of the alpha-phase in austenitic steel

CITED SOURCE: Tr. Vses. n.-i. i konstrukt. in-t khim. mashinostr, no. 34, 1960, 112-119

TOPIC TAGS: pondermotive magnetic method, alpha-phase, austenitic steel, breakaway force, process instrumentation device, transducer circuit, magnico alloy ANKO-4, 1Kh18N9T

TRANSLATION: The basic principles of the pondermotive magnetic method of determining the alpha-phase in austenitic steel are expounded. These principles are based on measurement of the attractive force of a permanent magnet. A description of the design is given and the circuit is shown of a special instrument, the alpha-phaseometer, by means of which it is possible to determine the

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content of alpha-phase in steel both in the specimens of arbitrary shape and directly in the parts and bars at a point volume of metal. The instrument consists of a transducer which is in direct contact with the part at the time of measurement and a measuring device which makes it possible to build up current in the transducer sufficient for attraction of the magnet and to exactly fix the moment of attraction. The transducer is designed on the basis of an electrical measuring instrument of the magnetoelectric type with the use of two cylindrical magnets (1-mm diameter) made of magnetic nickel-cobalt alloy (ANKO-4), which are secured symmetrically in a thin brass tube with similar poles on the opposite sides. The balance of the mobile system permits measurements at any position of the transducer in space. The measurement controlling device includes two circuits: a current regulation circuit in a coil and a signal circuit which indicates the moment of the magnet's attraction. The instrument makes it possible to take measurements of alpha-phase contact ranges from 0.5 to 30%. During this process the deviation of its readings from an average of three measurements at one point is less than 5%. Data are presented on the measurement of percent alpha-phase in sheet steel grade 1Kh18N9T with a thickness of 20 mm and in the welded seams of 1Kh18N9T, which were obtained with the aid of the alpha-phaseometer of the design described.

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AUTHORS: Akulov, N. S., Yesilevskiy, V. P.

TITLE: The Generalization of the Method of Magnetic Mirror Images

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 1, pp. 87 - 90

TEXT: The method of measuring the force necessary to separate a permanent magnet from the surface of the product or sample is now being more and more used. This force of the magnet is a function of magnetic susceptibility, which is determined by the phase composition and structure of the ferromagnetic substance. If a non-magnetic layer exists on the surface of the ferromagnetic material, the separating force of the magnet depends also on the thickness of this layer. This method offers wide possibilities of use, because it has many advantages. Make-and-break mechanisms are used in the tests. The separating force F is calculated on the basis of the "mirror image"-principle for a magnet with variations of h (distance between the surface of the product and the end of the magnet) within a wide range. Fig. 1 shows the curve of the dependence of the separating force of the magnet on the thickness of the non-magnetic layer, and Fig. 3 shows the theoretical curve of the influence of the shifting

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The Generalization of the Method of Magnetic Mirror Images

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of the magnetic pole upon the amount of the separating force. It is mentioned that the theoretical part of this paper was carried out by N. S. Akulov and the experiments by V. P. Yesilevskiy. There are 3 figures and 1 Soviet reference.

ASSOCIATION: Fiziko-tekhnicheskiy institut, g. Minsk (Institute of Physics and Technology, City of Minsk)

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Akulov, N.S.

S/170/60/003/008/010/014
B019/B054

AUTHOR: Akulov, N. S.

TITLE: On the Theory of the Magnetization Curve of Ferrites

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 8, pp. 85 - 87

TEXT: First, the author derives the differential equation (3) which offers the possibility of calculating the influence of elastic tensions on the magnetization curve in a thermodynamical way. The author obtains formula (7) for the spontaneous magnetization, which can also be obtained by methods of statistical mechanics. Finally, he investigates a crystal, and obtains formula (10) for the time average of the projection of the magnetic moment on the internal magnetic field. The calculations for ferrites and ferrite garnets show a quantitative agreement with the experiments. Finally, the author indicates formula (11) for the coercive force near the compensation point; this formula also agrees with the observations made. There are 5 Soviet references.

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On the Theory of the Magnetization Curve of Ferrites

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ASSOCIATION: Fiziko-tekhnicheskiy institut AN BSSR, g. Minsk (Institute of Physics and Technology of the AS BSSR, Minsk)

SUBMITTED: May 5, 1960

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