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S/058/62/000/005/068/119
AC61/A101

AUTHORS: Lyubov, B. Ya., Roytburd, A. L., Temkin, D. Ye.

TITLE: Mathematical analysis of the crystallization process in plain-shaped bodies

PERIODICAL: Referativnyy zhurnal, Fizika, no. 5, 1962. 10, abstract 5E81
(V sb. "Rost kristallov. T. 3", Moscow, AN SSSR, 1961, 68 - 74.
Discuss., 214 - 218)

TEXT: Problems of crystallization (temperature field and the motion of the front of the solidified phase) have been solved for plain-shaped bodies, such as plates, cylinders, and spheres. The calculations are based on the assumption that the thermophysical characteristics of the material are temperature-independent, and that there is neither supercooling nor overheating of the liquid phase.

[Abstracter's note: Complete translation]

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S/070/61/006/001/011/011
E032/E514

AUTHORS: Lyubov, B.Ya. and Aleksandrov, L.N.

TITLE: First Symposium on the Growing of Crystals of Various Metals

PERIODICAL: Kristallografiya, 1961, Vol.6, No.1, pp.150-151

TEXT: The Scientific Committee of the Academy of Sciences USSR concerned with the formation of crystals is currently organizing a series of sections dealing with the more important aspects of the problem. So far, the following sections have been set up: growth of crystals of metals, semiconductors, and piezo and ferro-electrics. A further section is concerned with the theory of the growing of crystals. It is intended to promote regular symposia on these topics. The present note reports a summary of the proceedings of the first symposium organized by the above committee. The symposium took place on October 24-26, 1960 at the Institut Kristallografii AN SSSR (Institute of Crystallography, AS, USSR), Moscow. Fifty representatives of the institutes of the AS, USSR, scientific research establishments and institutes of higher education in Moscow, Leningrad, Kiyev, Sverdlovsk, Khar'kov and others took part. Eleven papers and a number of other communications

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First Symposium on the Growing S/070/61/006/001/011/011
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were read. The symposium was opened by N. N. Sheftal' (deputy chairman of the above scientific committee) and by the chairman of the section concerned with the growing of crystals of metals, B. Ya. Lyubov. The following papers were among those read: Academician A. V. Shubnikov spoke on investigations of the crystallization process of ammonium chloride in a drop. V. T. Borisov and A. I. Dukhin (Institut metallovedeniya i fiziki metallov TsNIICHM, Institute of Metal Science and Physics of Metals of the Central Scientific Research Institute of Ferrous Metallurgy) reported on studies of the kinetics of the growth of crystals of cadmium. Ye. O. Esin and A. A. Kralina reported on the growth and the substructure of tin which was investigated at the Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AS, USSR) at Sverdlovsk. L. Ye. Ovsienko, Ye. I. Sosnina, and I. I. Z asimchuk, Institut metallofiziki AN UkrSSR (Institute of Metals Physics, AS, UkrSSR) discussed the conditions under which aluminium crystals are grown and the effect of these conditions on the degree of perfection of these crystals. They also considered effects such as diffusion and creep in these crystals. A. I. Bykhovskiy, L. N. Larikov and D. Ye. Ovsienko discussed the connection between the rate of

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crystallization during the $\alpha \rightleftharpoons \beta$ transformation of paradichlorobenzene and the super-cooling on the separation boundary between the phases. Further discussion of this work was given by A. A. Chernov (Institute of Crystallography, AS, USSR). V. G. Borisov spoke on the simultaneous solution of the thermal conductivity and diffusion problems in the case of the crystallization of a binary alloy in the absence of diffusion super-cooling. V. A. Timofeyeva, L. D. Prokhorov, A. I. Malyshev and N. A. Anisimov (Institute of Crystallography, AS, USSR) reported on single crystals of copper, aluminium and nickel having a weight greater than 10 kg which they had grown in a special high temperature furnace. The apparatus can be used to grow pure single crystals of any metals with melting points below 1600°C. L. M. Soyfer and V. I. Startsev (IREA, Khar'kov) discussed the zone methods of purification and growing of high-purity single crystals of antimony and bismuth. N. A. Brilliantov and L. S. Starostina (Institute of Crystallography) reported on a similar method used to grow molybdenum crystals. V. F. Miuskov (Institute of Crystallography, AS, USSR) read a paper on the growing of single crystals of molybdenum in vacuum, using high heating rates. Direct heating of the specimen by an electric Card 3/4

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current was used. L. N. Aleksandrov (Saransk) reported on the kinetic parameters of formation of single crystals of tungsten. A film on the growing of crystals was shown by Academician A. V. Shubnikov and V. F. Parvov. The next symposium is planned for 1961. ✓

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S/126/61/011/002/002/025
E021/E435

AUTHORS: Krasko, G.L. and Lyubov, B.Ya.

TITLE: Towards a Theory of the Behaviour of Concentration
Inhomogeneities in Regular Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.2,
pp.186-193

TEXT: Diffusion in the binary single-phased solid solutions during chemical interaction of the atoms is examined neglecting the influence of concentration stresses. The starting point is the theory of regular solutions where it is assumed that the solution is completely disordered in terms of long-range order. The effective coefficient is given as.

$$D = D_0 \left[1 - \frac{2zv}{kT} c(1 - c) \right] \quad (6)$$

where z is the number of nearest neighbours in the alloy lattice, v is the displacement energy, given by the energies of interaction of the different atomic vapours, and c is the concentration of the components. Where interaction between the atoms in a system takes place, the normal equation for a diffusion current
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Towards a Theory ...

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$$\frac{\partial c}{\partial t} = \frac{\partial}{\partial x} \left(D_0 \frac{\partial c}{\partial x} \right), \quad (1)$$

is altered considerably and becomes

$$\frac{\partial c}{\partial t} = D_0 \frac{\partial}{\partial x} \left[\left(1 + \frac{\partial \ln \gamma}{\partial \ln c} \right) \frac{\partial c}{\partial x} \right], \quad (3)$$

where γ is the coefficient of activity of the component in the solution. In order to obtain a complete idea of the behaviour of concentration inhomogeneities in a solid solution, this equation must be solved with definite initial and limiting conditions. An approximate solution is given

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$$\begin{aligned}
 V(0, \tau) &= V_0(0, \tau) + \bar{c}V_1(0, \tau) + \bar{c}^2V_2(0, \tau); \\
 V(0, \tau) &= \frac{1}{\tau^{\lambda/2}} - \bar{c} \frac{\beta}{\tau} \left[1 - \frac{1}{(2\tau-1)^{\lambda/2}} \right] + \bar{c}^2 \left\{ \frac{0.83(2\beta^2-\lambda) + 0.78\beta^2}{\tau^{\lambda/2}} - \right. \\
 &\quad - 2\beta^2 \left[\frac{1}{\tau^{\lambda/2}(2\tau-1)^{\lambda/2}} - \frac{1}{(3\tau-2)^{\lambda/2}(2\tau-1)} \right] - \frac{2\beta^2-\lambda}{(3\tau-2)^{\lambda/2}} + \\
 &\quad \left. + \frac{0.29(2\beta^2-\lambda)}{\tau^{\lambda/2}} \ln[(3\tau-2)^{\lambda/2} + (3\tau)^{\lambda/2}] - \right. \\
 &\quad \left. - \frac{0.5\beta^2}{\tau^{\lambda/2}} \left[\operatorname{arc\,tg} \frac{\tau^{\lambda/2}}{(3\tau-2)^{\lambda/2}} + \operatorname{arc\,tg} \frac{\tau^{\lambda/2}(4\tau-3)}{(3\tau-2)^{\lambda/2}} \right] \right\}. \tag{12a}
 \end{aligned}$$

This is checked by experiments on the iron-chromium system where a single-phase solid solution exists over a wide range of temperature and concentration. Fig.1 shows the function

$$D' = \frac{2zv(c)}{RT} c(1-c)$$

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as a continuous line. In order to use this in the solution, it must be approximated to a quadratic equation in c . The dotted line shows this approximation

$$D^1 = (-0.67 + 7.9c - 6.58c^2) \frac{10^3}{T}$$

Fig.2 shows the expression (12a) for three temperatures: 380, 450 and 550°C, and for 20 at.% Cr (x - axes: top axis in seconds, middle in hours and bottom in days). At 450°C the initial inhomogeneity begins to increase and is then stabilized. At 550°C the concentration in the centre of the inhomogeneity quickly increases, reaches a maximum value and then quickly decreases. If inhomogeneities arise at 380°C there will be practically no increase. Thus, the conditions for increase in concentration inhomogeneities exist only in a narrow temperature range. At higher temperatures diffusion processes are too intensive and at low temperatures the diffusion processes are too slow. The results of the calculation agree qualitatively with experimental

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data. There are 2 figures and 9 references: 6 Soviet and
3 English.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIICHM
(Institute for Science of Metals and Physics of Metals
TsNIICHM)

SUBMITTED: May 26, 1960 (initially)
September 12, 1960 (after revision)

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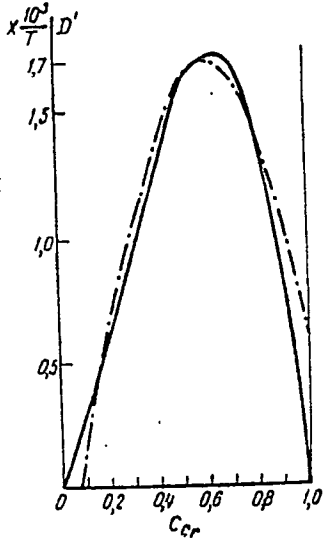


Fig.1.

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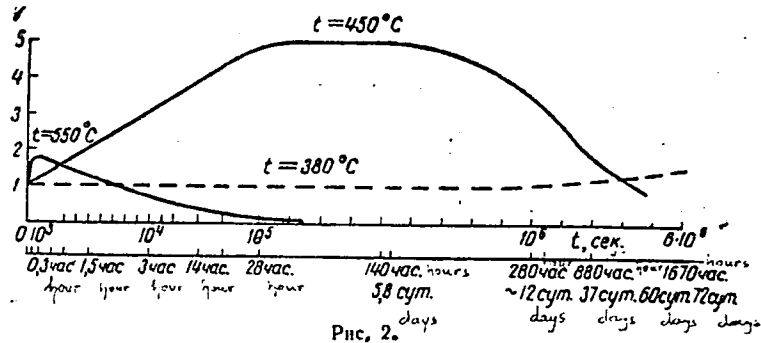


Fig.2.

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B125/B108

AUTHORS: Aleksandrov, L. N., and Lyubov, B. Ya.

TITLE: Theoretical analysis of the kinetics of decomposition of supersaturated solid solutions

PERIODICAL: Uspekhi fizicheskikh nauk, v. 75, no. 1, 1961, 117 - 150

TEXT: The present theoretical survey is based on experimental investigations by G. V. Kurdyumov (Problemy metallovedeniya i fiz. metallov, M., Metallurgizdat, Sb. za 1949, 1951, 1952, 1955, 1958 gg.), S. S. Shteynberg (Metallovedeniye, t. I., M., Metallurgizdat, 1952), S. T. Konobeyevskiy, and their teams. In one-component systems (e. g., in metals with polymorphism), regions with the structure of a new modification appear after cooling below the stability range of the high-temperature phase. These regions increase in size for thermodynamical reasons, and finally take possession of the whole volume of the system. Per unit time and unit volume, $I = (\alpha/v_0) (RT/h) \exp(-u/kT) \exp(-w/kT) (3)$, "germs" are transformed into centers. $w = (1/3)\sigma S_{cr}$, $S_{cr} = 4\pi r_{cr}^2$, $r_{cr} = 2\sigma/\Delta F_0$. Here,

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Theoretical analysis of the kinetics...

the regions smaller and larger than some critical dimensions are called "germs" and "centers", respectively. σ is the surface tension at the phase boundary, ΔF_0 - the variation of the free energy corresponding to the production of one unit volume of new phase, q_{cr} - the radius of the critical germ, h - Planck's constant, v_0 - the specific volume, u - the activation energy of the transition of atoms through the boundary between the two phases. a , ($1 < a < 10$), is a structural parameter. For

$\left| \frac{\Delta F_0}{2RT} \left(1 - \frac{q_{cr}}{q} \right) \right| \ll 1$ (5) the rate of the directed increase of the centers is

equal to $v = \frac{dq}{dt} = \frac{16\pi r_a^4 \Delta F_0}{9h} \left(1 - \frac{q_{cr}}{q} \right) \exp(-u/kT)$ (4), where r_a is the atomic

radius. If the phases are separated by a plane boundary,

$dx/dt = (\Delta F_0 / \pi h r_a^2) (v_0 / N)^2 \exp(-u/kT)$ (7). From the ratio $\eta =$ (converted volume/initial volume), the conversion time t can be found as a function

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Theoretical analysis of the kinetics...

of temperature (A. N. Kolmogorov, Izv. AN SSSR, ser. fiz. no. 3, 365 (1937)). Investigations by B. Ya. Pines (ZhTF, 24, 1521 (1954), V. S. Gorskiy (Phys. Z. Sowietunion, 8, 457 (1935), S. T. Konobeyevskiy (ZhETF, 13, 200, 418 (1943)), M. I. Zakharova and N. F. Lashko (Izv. AN SSSR, ser. tekhn., no. 7, 1015 (1946), and A. A. Bochvar concerning two-component systems are quoted. The kinetics of phase conversions in two-component systems are determined by the rate of "rebuilding" of the solvent lattice and by the diffusion rate of the dissolved component. The authors studied the separation of ferrite from undercooled austenite of pre-eutectoid composition. The centers are generated in the same manner as in a one-component system, and may be calculated by the general formula (3); in the general case

$$t_n = \left[-\frac{15h \ln(1-\eta)}{8\pi RT D_0^{3/2} \beta^3} \exp\left(\frac{W+U+\frac{3}{2}Q}{RT}\right) - \frac{5\pi^2 d^{12} (\Delta F_0)^2 \tau^4}{8 \cdot 3^2 h^2 D_0^{3/2} \beta^3} \exp\left(\frac{\frac{3}{2}Q-3U}{RT}\right) + \tau^{3/2} \right]^{2/3} \quad (97)$$

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holds, where $U = Nu$, $W = Nw$, N - Avogadro's number. For $t \ll \tau$, the kinetics of conversion are characterized by the rate of conversion. In three-component systems, the third element may considerably change the critical size q_{cr} of the centers of the new phase. Therefore, it may increase or decrease the effect of the mechanism of "rebuilding" the new lattice in phase conversion. In an iron-carbon-chromium system, for instance, the effect of chromium increases q_{cr} considerably and, therefore, also stresses

the influence of the rebuilding mechanism. There are 27 figures and 65 references: 57 Soviet and 8 non-Soviet. The three most recent references to English-language publications read as follows: D. Turnbull and J. Fischer, J. Chem. Phys. 17, 71 (1949); J. Frye, E. Stansbury, D. McElroy, Trans. AIME 197, 219 (1953); R. W. Parell and R. F. Mehl, Trans. AIME 194, 771 (1952).

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S/030/62/000/001/010/011
B105/B101

AUTHOR: Lyubov, B. Ya., Doctor of Physics and Mathematics

TITLE: Research into the theory of crystal growth and phase transitions

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 1, 1962, 134 - 136

TEXT: The nauchnyy sovet po probleme "Obrazovaniye kristallov" pri Otdelenii fiziko-matematicheskikh nauk Akademii nauk SSSR (Scientific Council for the Problem "Growth of Crystals" at the Department of Physics and Mathematics of the Academy of Sciences USSR) and the Otdel fiziki tverdogo tela i poluprovodnikov Akademii nauk BSSR (Department of Solid-state Physics and Semiconductors of the Academy of Sciences BSSR) held an All-Union Conference in Minsk from September 18 to 23, 1961. It dealt with problems of the crystal growth theory and with the development of physical conceptions on the mechanism of phase transitions. The problem of crystal growth from the liquid phase was leading among the themes of the Conference. N. N. Sirota, Chairman of the Organizing Committee, opened the Conference and underlined the main trends of investigations in the field

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Research into the theory of...

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of phase transformations; V. K. Semenchenko reported on the part played by surface tension in the processes investigated; F. K. Gorskiy discussed the method of determining the surface tension; M. I. Kozlovskiy, P. S. Vadilo, V. O. Yesin, and A. A. Kralina reported on the structure of the crystallization surface and the kinds of crystal growth; N. N. Sirota, E. M. Smolyarenko, M. V. Chukrov et al. dealt with problems of the effect of external influences on the crystallization process; A. I. Kitaygorodskiy reported on the investigation of phase transformations of organic and metallic crystals; Ya. V. Grechnyy, A. L. Roytburd, and D. Ye Temkin discussed problems connected with the stability of the plane form of a crystallization front; A. I. Bykhovskiy reported on tensions arising during the transformation in the solid phase. It was finally stated that qualified theoretical physicists must be enlisted for the development of research into crystal growth.

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LYUBOV, B.Ya., doktor fiziko-matematicheskikh nauk

Theoretical analysis of austenite decomposition kinetics in
carbon and alloy steels. Probl. metalloved. i fiz. met. no. 7:219-
230 '62. (MIRA 15:5)
(Steel alloys--Metallography) (Phase rule and equilibrium)

17,900

S/126/62/013/002/001/019
E039/E135

AUTHORS: Garkusha, I.P., and Lyubov, B.Ya.

TITLE: Calculations on the speed of growth of spherical centres of new phases, limited by diffusion through the interstitial region

PERIODICAL: Fizika metallov i metallovedeniye, v. 8, no.2, 1962, 161-165

TEXT: This is one of the basic problems in the theory of phase transformation limited by diffusion. Such calculations are based on the assumption of an infinite medium surrounding the centre through which the diffusion proceeds. However, in reality it appears that the diffusion region has a radius of the order of half the average distance between centres. Consequently, the growth of these centres cannot be examined independently and the problem is essentially complex. Diffusion through the interstitial regions must be taken into account. A general solution is obtained for the case when the concentration of dissolved material inside the diffusion zone satisfies the non-stationary equation of diffusion. These calculations reduce to a system of
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Calculations on the speed of growth.. 6/126/62/613/002/001/019
E079/E13

Transcendental equations for two parameters p_1 and p_2 which define the rate of growth of the centres. The solutions of these equations are expressed graphically. As an illustration the case of spherical centres of graphite grown in a mixture of austenite and cementite, with cementite particles distributed uniformly, is examined. Growth is produced by diffusion of carbide particles and the subsequent diffusion of carbon through the interstitial spherical layer of austenite surrounding the centre. The values of the growth constant calculated for stationary and non-stationary processes are compared with known experimental data. The results based on stationary processes are $\sim 15-20\%$ greater than those based on non-stationary, and both exceed the experimental results by a factor of about 5. The question of the width of the diffusion cone surrounding the growth centre of a new phase is examined and calculations for the case of the growth of ferrite centres in supercooled austenite are made. The solution of this problem can be used in the analysis of physico-chemical processes accompanying the growth of crystals from solution.

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Calculations on the speed of growth.. S. 126/02/013/002/001/019
E039/E135

There are 4 figures and 1 table.

ASSOCIATION: Dnepropetrovskiy gosudarstvennyy universitet
(Dnepropetrovs. State University,
Institut metallovedeniya i fiziki metallov
TsNIChM
(Institute of Science of Metals and Physics of
Metals TsNIChM)

SUBMITTED: April 21, 1961

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LYUBOV, B.Ya., doktor fiz.-matem.nauk

Research on the theory of growth and phase transitions of crystals.
Vest. AN SSSR 32 no.1:134-136 Ja '62. (MIRA 13:1)
(Crystallography, Mathematical--Congresses)

S/020/62/142/002/015/029
B104/B138

AUTHORS: Krasko, G. L., and Lyubov, B. Ya.

TITLE: Theory of the Cottrell atmosphere

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 2, 1962, 326-329

TEXT: A binary single-phase disordered solid solution with boundary dislocations was examined and its equilibrium conditions were determined. The free energy of the unit volume of an elastic inhomogeneous solution in the absence of stresses, and presupposing the superposition principle

($\epsilon_{ik} = \epsilon_{ik}^D + \epsilon_{ik}^C$), is represented in the form

$$F = F_{\text{хим}} + \frac{9}{2} K\omega^2 (c - c_0)^2 - 3K\omega (c - c_0) \epsilon_{ii}^C - 3K\omega (c - c_0) \epsilon_{ii}^D + f. \quad (4).$$

$F_{\text{хим}} = F_0 - \frac{9}{2} K\omega^2 (c - c_0)^2$ is the free energy in purely chemical interaction, c is the impurity concentration in a given point of the solution, c_0 is the mean impurity concentration, K and G are the elastic bulk moduli of compression and shear, ϵ_{ik} is the deformation tensor, ω is a linear

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Theory of the Cottrell atmosphere

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coefficient of "concentration expansion", ϵ_{ik}^D is the deformation if there is only a dislocation field, and ϵ_{ik}^C is the deformation with only an inhomogeneous concentration field. f denotes that part of the free energy which does not explicitly depend on c . The fourth term of (4) describes the energy of interaction between the concentration and dislocation fields. The second and third term describe the energy of the inhomogeneous concentration field. With a change in concentration of impurity atoms the energy of an independent deformation of a given element is equal to F_{XIM} in amount. The chemical potential of impurity atoms is examined and the following quadratic equation is obtained:

$$\begin{aligned} & \left(a - \frac{1}{2c_0^2} - 3\omega^2\beta \right) (c - c_0)^2 + & (11). \\ & + \left[\frac{1}{c_0} - 2a(1 - c_0) + 3\omega^2\beta(1 - c_0) - \frac{3}{4}\omega\gamma \right] (c - c_0) + \\ & + \frac{3}{4}\omega\gamma(1 - c_0) = 0. \end{aligned}$$

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Theory of the Cottrell atmospheres

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$\alpha = z\nu/RT$, $\beta = \kappa K/RT$, $\gamma = (\kappa K b/2\pi RT)(\sin\theta/r)$. By solving this equation with respect to $(c - c_0)$ one obtains the concentration of impurities in the atmosphere. In the case of $c \ll 1$, if the elastic atomic interaction is slight, and the chemical interaction is negligible, Cottrell's relation is obtained for c . The requirement that the moduli of elasticity and ω be constant restricts the present results to a narrow concentration range around c_0 . In addition, the investigation was kept within the linear theory of elasticity. There are 8 references: 4 Soviet and 4 non-Soviet. The two references to English-language publications read as follows: A. H. Cottrell, B. A. Bilby, Proc. Phys. Soc., A 62, 49 (1949); J. S. Koehler, Phys. Rev., 60, 397 (1941).

ASSOCIATION: Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii im. I. P. Bardina (Institute of Metallography and Physics of Metals of the Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin) ✓

PRESENTED: April 6, 1961, by G. V. Kurdyumov, Academician

SUBMITTED: April 4, 1961

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S/020/62/144/002/011/028

3104/E'02

AUTHORS: Sarkusha, I. V., Lyusov, B. Ia.

TITLE: The mechanism of growth of a ferrite nucleus during isothermal austenite decomposition

ABSTRACT: Akademiya nauk SSSR. Doklady, v. 144, no. 2, 1962, 318-321

NOTE: Diffusion processes accompanying the growth of ferrite nuclei, and the factors limiting on them, were studied in quantitative approximation. Such growth is considered to be similar to that of the center of a new phase during polymorphic transformation. For small nuclei, the carbon distribution in austenite can be described by a Laplace equation. The following relation is derived for the growth rate:

$$\frac{dp}{dt} = \frac{k_1 [\Delta F_0^{Fe}/RT - (C_0 - C_1^*) - 2\sigma V_{Fe}/RT\rho]}{(\Delta F_0^{Fe}/RT - 2\sigma V_{Fe}/RT\rho) k_1 \rho/D_0 + 1}$$

The carbon concentration on the surface of the ferrite nucleus is:

$$C_1 = C_0 - (1/k_1) \frac{dp}{dt} + \Delta F_0^{Fe}/RT - 2\sigma V_{Fe}/RT\rho.$$

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The mechanism of growth of a ferrite ...

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3'04/3'02

Here C_1 denotes the carbon concentration inside the ferrite nucleus, ΔF is the total change of free energy as a unit volume of a new phase is formed, and D_2 is the coefficient of carbon diffusion in austenite.

Calculations using these formulas reveal that the rate essentially depends at first on the transition of Fe atoms through the interface and later on the diffusion of C into the austenite volume. There are 2 figures. f

ASSOCIATION: Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta Chernoy metallurgii im. I. P. Bardina (Institute of Metal Science and Physics of Metals of the Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin).
Dnepropetrovskiy gosudarstvennyy universitet im. 300-letiya vsoyedineniya Ukrainy s Rossiyev (Dnepropetrovsk State University imeni 300 Years of Reunion of the Ukraine with Russia)

December 28, 1961, by G. V. Kurdyumov, Academician
December 25, 1961

GARKUSHA, I.P.; LYUBOV, B.Ya.

Mechanism underlying the growth of a ferrite center in the isothermal breakdown of austenite. Dokl.AN SSSR 144 no.2:318-321 My '62. (MIRA 15:5)

1. Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii im. I.P.Bardina i Dnepropetrovskiy gosudarstvennyy universitet im. 300-letiya vossоединeniya Ukrainy s Rossiyei. Predstavleno akademikom G.V.Kurdyumovym.
(Ferrates) (Austenite--Metallurgy)

S/020/62/147/003/010/027
B104/B186

AUTHORS: Krasko, G. L., Lyubov, B. Ya.

TITLE: Continuum theory of the elastic interaction between the atoms
in interstitial solid solutions

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 3, 1962, 562 - 565

TEXT: The atoms of a substance dissolved in a crystal with cubic, body-centered lattice can be located at three different sites. The probabilities of population of these sites are equal in the equilibrium when no external forces are present. The free energy per unit volume is

$$F = F_{\text{HBM}} - \frac{3}{8} K (\alpha_{ll}^v \alpha_{ll}^n + \alpha_{ik}^v \alpha_{ik}^n) c^v c^n - \frac{3}{4} K e_{ik} \gamma_{ik}^v c^v + \frac{3}{8} K (e_{ll}^2 + e_{ik}^2), \quad (6)$$

for a crystal of arbitrary symmetry with restriction to the isotropic case. The calculations for a cubic crystal do not yield anything essentially new, but are very complex. $\gamma_{ik}^v = \alpha_{ik}^v + \alpha_{ll}^v \delta_{ik}$, e_{ik} is the strain tensor, α_{ik}^v is a tensor describing the expansion of the crystal owing to impurity atoms, $c^v = c_v - c_0/3$, where c_0 is the mean concentration of the impurity atoms,
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Continuum theory of the...

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c_v ($v = x, y, z$) is the concentration of the impurity atoms at the three types of sites, F_{XMM} is the free energy in purely chemical interaction of the atoms. With the aid of the relations

$$F_{\text{BH}} = \frac{3}{8} K (e_{ik}^{\text{BH}} - \delta_{ik} e_{ll}^{\text{BH}})^2, \tag{11}$$

$$F_c = -\frac{3}{8} K (x_{ll}' x_{ll}'' + x_{ik}' x_{ik}'' - c' c'') - \frac{3}{4} K \gamma_{ik}^c e_{ik}^c c' + \frac{3}{8} K (e_{ik}^c - \delta_{ik} e_{ll}^c)^2,$$

$$\Phi = -\frac{3}{4} K e_{ik}^{\text{BH}} \gamma_{ik}^c c' + \frac{3}{4} K (e_{ik}^{\text{BH}} e_{ik}^c + e_{ll}^{\text{BH}} e_{ll}^c).$$

the free energy is written in the form $F = F_{\text{XMM}} + F_{\text{BH}} + F_c + \Phi$, where F_{BH} is the free energy of the external elastic field, F_c and Φ are the free energies of the elastic interaction of the impurity atoms with one another and with the external field. In equilibrium, the free energy has a minimum for which

$$\left(\frac{\partial F}{\partial N_v} \right)_{e_{ik}=\text{const}} = \lambda = \text{const} \quad (v = x, y, z); \tag{7a}$$

$$\partial \sigma_{ik} / \partial x_k = 0. \tag{7b}$$

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Continuum theory of the...

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B104/B186

The first equation expresses the constancy of the chemical potential $\mu_{XMM} = \partial E_{XMM} / \partial N_{\nu}$ of the impurity atoms, the second is the equation of elasticity. The equations (7) lead to

$$\mu_{XMM} - \frac{3}{4} \frac{K}{N} (x_{II}^0 x_{II}^0 + x_{ik}^0 x_{ik}^0) c^0 - \frac{3}{4} \frac{K}{N} e_{ik}^c \gamma_{ik}^c - \frac{3}{4} \frac{K}{N} e_{ik}^{EH} \gamma_{ik}^c = \lambda \quad (12).$$

From this equation ϵ_{ik}^c can easily be eliminated if the deformation caused by a non-uniform distribution of the impurity atoms can be neglected. Then one obtains a system of integro-differential equations interrelating c^0 and ϵ_{ik}^{EH} in the state of equilibrium. For every practical case ϵ_{ik}^{EH} can be determined from the relevant equilibrium equation, F_{XMM} can be ascertained in the approximation to regular solutions. The theory permits of describing effects associated with the rearrangement of atoms.

Card 3/4

Continuum theory of the...

S/020/62/147/003/010/027
3104/3186

ASSOCIATION: Institut metallovedeniya i fiziki metallov Tsentral'nogo
nauchno-issledovatel'skiy instituta chernoy metallurgii
(Institute of Metal Studies and the Physics of Metals of the
Central Scientific Research Institute of Ferrous Metallurgy)

PRESENTED: June 12, 1962, by G.V. Kurdyumov, Academician

SUBMITTED: June 5, 1962

Card 4/4

GARKUSHA, I.P.; LYUBOV, B.Ya.

Calculating the growth rate of the spherical center of a new phase limited by diffusion through the intermediate region.
Fiz. met. i metalloved. 13 no.2:161-165 F '62. (MIRA 15:3)

1. Dnepropetrovskiy gosudarstvennyy universitet i Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Phase rule and equilibrium) (Diffusion)

9/058/63/000/001/090/120
A160/A101

AUTHOR: Lyubov, B. Ya.

TITLE: A theoretical analysis of the kinetics of austenite disintegration in carbon and alloyed steels

PERIODICAL: Referativnyy zhurnal, Fizika, no. 1, 1963, 99, abstract 1E668 ("Sb. tr. In-t metalloved. i fiz. metallov Tsentr. n.-i. in-ta chernoy metallurgii", 1962, #7, 219 - 230)

TEXT: An investigation is carried out of the problems of phase transformation in single-component, two-component and alloyed and two-component systems. The investigation is reduced to an analysis of the kinetics of the origin and growth of nuclei until they attain the critical size. It is shown that a competition of two processes takes place for a two-component system, i.e. the process of the diffusion rate of the components, and the processes of the lattice re-arrangement. In the course of one phase transformation, both the one and the other process may be decisive at its various stages. Obtained was a kinetic curve of the austenite disintegration, which generally coincided with

Card 1/2

A theoretical analysis of the...

S/058/63/000/001/090/120
A160/A101

the data of the experiment. For this particular case, the disintegration process is apparently limited at the first stage by the lattice re-arrangement process, and at the second stage - by diffusion of C. It is assumed that the effect of the alloying element on the kinetics of the two-phase disintegration is brought about by changing the parameters of the problem: the equilibrium concentrations of both phases, the energy of activations, the diffusion coefficient, etc. The diversity of the shape of the kinetical curves for austenite, alloyed with various elements is due to a change of the determining processes, i.e. the diffusion and the re-arrangement processes. It is shown that cases are possible in which the disintegration kinetics is determined by the diffusion rate of the alloying component. ✓

[Abstractor's note: Complete translation]

2/2

KRASKO, G.L.; LYUBOV, B.Ya.

On the continuity theory of elastic interaction of atoms in
interstitial solid solutions. Dokl. AN SSSR 147 no.3:562-565
N '62. (MIRA 15:12)

1. Institut metallovedeniya i fiziki metallov Tsentral'nogo
nauchno-issledovatel'skogo instituta chernoy metallurgi. Pred-
stavleno akademikom G.V. Kurdyumovym.
(Crystal lattices) (Solutions, Solid)

LYUBOV, B. Ya., CHERNOV, A. A.

"Main Directions in the Theory of Crystal Growth."

report submitted for the Conference on Solid State Theory, held in Moscow,
December 2-12, 1963, sponsored by the Soviet Academy of Sciences.

LYUBOV, B.Ya.; RAZORENOV, V.M.

Effect of drift on the kinetics of phase transformations limited
by diffusion. Fiz. met. i metalloved. 16 no.5:655-662 N '63.

(MIRA 17:2)

1. Institut metallovedeniya i fiziki metallov Tsentral'nogo nauch-
no-issledovatel'skogo instituta chernoy metallurgii.

ALEKSANDROV, L.N.; LYUBOV, B.Ya.

Theory of the growth of bainite crystals in the intermediate transformation of austenite. Dokl. AN SSSR 151 no.3:552-555 JI '63.
(MIRA 16:9)

1. Mordovskiy gosudarstvennyy universitet i Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii im. I.P.Bardina. Predstavleno akademikom G.V.Kurdyumovym.

(Crystals--Growth) (Austenite)

LYUBOV, B.Ya.

Solution of some kinetic equations in the theory of dislocations.
Dokl. AN SSSR 152 no.5:1092-1095 0 '63. (MIRA 16:12)

1. Institut metallovedeniya i fiziki metallov Tsentral'nogo
nauchno-issledovatel'skogo instituta chernoy metallurgii im. I.P.
Bardina.

ALEKSANDROV, L.N.; LYUBOV, B.Ya.

Concerning the theory of austenite transformation in the intermediate region. Probl. metalloved. i fiz. met. no.8:227-234 '64. (MIRA 18:7)

ACCESSION NR: AP4043836

S/0020/64/157/005/1100/1102

AUTHORS: Garkusha, I. P.; Lyubov, B. Ya.

TITLE: Calculation of the diffusion-governed kinetics of dissolution of a spherical inclusion

SOURCE: AN SSSR. Doklady*, v. 157, no. 5, 1964, 1100-1102

TOPIC TAGS: dissolution, diffusion boundary layer, lead, tin, metal hydropemeability, solution kinetics

ABSTRACT: The authors analyze quantitatively the rate at which a spherical particle situated in an unbounded medium decreases in size, under the condition that the concentration on its surface remains at the equilibrium value for the given temperature, and the rate of the process is determined by diffusion in the surrounding medium. A theoretical analysis of this problem is desirable, because the rate of diffusion cannot be determined experimentally directly and must

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ACCESSION NR: AP4043836

be estimated by indirect measurements. The problem is solved by expressing the diffusion equations in a form that takes into account the spherical symmetry of the problem and by expanding the unknown dimension and mass in a series in fractional powers. A numerical example for a lead sphere of approximately 0.1 mm in diameter in liquid tin yields at $T = 250^\circ$ a time 2 seconds for the linear dimensions to decrease by one-half, and 5 seconds for complete dissolution; for $T = 320^\circ$ the respective times are 0.7 and 1 second. This report presented by G. V. Kudryumov. Orig. art. has: 3 figures and 11 formulas.

ASSOCIATION: Dnepropetrovskiy gornyy institut im. Artema (Dnepropetrovsk Mining Institute); Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii im. I. P. Bardina (Institute of Metal Research and Metal Physics, Central Scientific Research Institute for Ferrous Metallurgy)

Card 2/3

ACCESSION NR: AP4043836

SUBMITTED: 19Mar64

ENCL: 00

SUB CODE: MM

NR REF SOV: 004

OTHER: 003

Card 3/3

LYUBOV, E.Ya.; SOLOV'YEV, V.A.

Possibility of the existence of a stable segregation of atoms of a dissolved material and the nucleation of coherent centers of a new phase in a field of elastic, edge dislocation stresses. Fiz. met. i metalloved. 19 no.3:233-342 Mr '65. (MIRA 1965)

1. Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno-issledovatel'skogo instituta shernoy metallurgii imeni Bardina.

L 64308-65 EWA(c)/EWT(l)/EWT(m)/EWP(b)/T/EWP(W)/EWP(t) IJP(c) GG/JD
ACCESSION NR: AP5012766 UR/0020/65/161/006/1324/1327

AUTHOR: Lyubov, B. Ya.; Chernizer, G. M.

TITLE: Concerning the question of the energy scattered by a moving dislocation by heavy impurity atoms

SOURCE: AN SSSR. Doklady, v. 161, no. 6, 1965, 1324-1327

TOPIC TAGS: crystal dislocation phenomenon, crystal impurity, shear stress, energy scattering, internal friction

ABSTRACT: A simplified expression is obtained for the energy scattered by a dislocation gliding with constant velocity against a heavy impurity atom which is located in the glide plane. The simplification is based on the assumption that the host atom is much heavier than the impurity atom, so that the variation of the force constants can be neglected. An expression for the shear stress necessary to overcome the dynamic friction forces is also presented. The limiting cases of screw and edge dislocations are analyzed. By way of numerical examples, solutions of 4% Ag in Al or 4% Hf in Li are considered. Figure 1 of the Enclosure is a typical variation of shear stress against dislocation speed. It is pointed out in the conclusion that the scattering of the energy of moving dislocations by heavy impurity atoms is only one of several effects governing the dynamic friction forces

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L-64308-65

ACCESSION NR: AP5012766

and shear. An increase in the heavy-atom concentration in the solid solution may increase the contribution to the energy scattering. "The authors thank I. N. Kidin for help with the work and V. L. Indenbom and M. A. Shtremel' for a discussion of the results." This report was presented by G. V. Kurdyumov. Orig. art. has: 2 figures, 11 formulas, and 1 table.

ASSOCIATION: Institut metallovedeniya i fiziki metallov Tsentral'nogo nauchno issledovatel'skogo instituta chernoy metallurgii im. I. P. Bardina (Institute of Metal Research and Metal Physics of the Central Scientific Research Institute for Ferrous Metallurgy); Moskovskiy institut stali i splavov (Moscow Institute of Steel and Alloys)

SUBMITTED: 12 Nov 64

ENCL: 01

SUB CODE: MM, SS

NR REF SOV: 004

OTHER: 007

Card 2/3

L 61308-65

ACCESSION NR: AP5012766

ENCLOSURE: 01

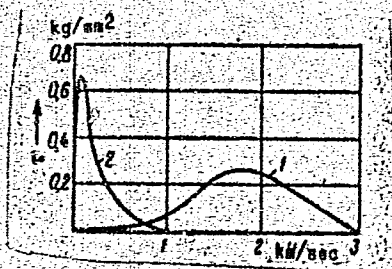


Fig. 1. Shear stress necessary to overcome the dynamic friction force vs. speed of screw dislocation in a solid solution.

1 - Aluminum, 4% at. Ag at room temperature.

2 - Lithium, 4% at. Hf at 160°

Card 3/3

ACC NR: AP7002737

SOURCE CODE: UR/0126/66/022/006/0865/0870

AUTHOR: Lyubov, B. Ya.; Solov'yev, V. A.

ORG: TsNIChERMET im. I. P. Bardin

TITLE: Calculating the diffusion growth rate of a pore under the action of applied stresses

SOURCE: Fizika metallov i metallovedeniye, v. 22, no. 6, 1966, 865-870

TOPIC TAGS: diffusion, porosity, polycrystal, crystal vacancy, plastic deformation, metal grain structure

ABSTRACT: It is experimentally known (Rozenberg, V. M., et al. FMM, 1966, 22, 438) that the application of relatively small stresses at high temperatures causes the growth of macroscopic pores at the grain boundaries of Cu polycrystals, chiefly owing to the diffusion of vacancies from the material to the pore. Two possible interpretations of this process are analyzed: 1) diffusion of vacancies into the pore because they attain their equilibrium concentration earlier at the surface of the pore than in the material; and 2) vacancy supersaturation of the material owing to plastic deformation. The kinetics of pore growth in the presence of applied stresses is analyzed and it is shown that changes in equilibrium concentration owing to elastic

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UDC: 548.4.01

ACC NR: AP7002737

stresses alone are not enough to assure the observed growth rate of the pore. Plastic deformation, on the other hand, leads to an increase in the concentration of vacancies in the material, thus leading to an excess concentration of vacancies and hence interpretation 2) appears to be more probable: supersaturation with vacancies of the material owing to plastic deformation is responsible for pore growth. It is worth noting that even a small increase in the diffusion coefficient D can markedly reduce the extent of vacancy supersaturation needed to cause pore growth. At the same time, plastic deformation can markedly affect D . Thus the above interpretation accounts for the experimentally observed growth rates in the presence of a reasonably moderate degree of supersaturation. In the general case, particularly during the initial stage of the process (small pores), allowance must also be made for the additional transport of vacancies along the grain boundaries of the polycrystal. Orig. art. has: 27 formulas.

SUB CODE: 11 ,20/ SUBM DATE: 07Apr66/ ORIG REF: 009/ OTH REF: 001

Card 2/2

LYUBOV, N.

Finding an objective method for judging the fatness of animals.
Zhivotnovodstvo 21 no.11:93 N '59 (MIRA 13:3)

1. Glavnyy zootekhnik Kəragynskoy sel'skokhozyaystvennoy inspektsii
Permskoy oblasti.
(Stock and stockbreeding)

LYUBOV, S.L., professor; KUTUSHEV, F.Kh., kandidat meditsinskikh nauk;
SHIRYAYEVA, K.F.

Modern concepts of the diagnosis and treatment of patent ductus
arteriosus. Vest.khir.76 no.8:11-18 S '55 (MLRA 8:11)

1. Iz 2-y fakul'tetskoy khirurgicheskoy kliniki (nach.P.A.Kupri-
yanov) i kliniki detskikh bolezney (nach.prof. M.S.Maslov)
Voyenno-meditsinskoy ordena Lenina akademii im. S.M.Kirova.
(DUCTUS ARTERIOSUS, PATENT
diag. & ther.)

IVANOV, A A.; OBODOVSKIY, B.A.; SMIRNOV, G.M.; BOCHAROV, V.A.; KOSTYUCHENKO,
N.F.; LYUBOV, V.A.; MANOV, V.M.; MEDYNSKIY, A.F.; MISHCHENKO, V.P.;
FURSA, I.G.

Investigating 350- and 480-ton welded steel-pouring ladles.
Izv.vys.ucheb.zav.; chern. met. 8 no.4:220-223 '65. (MIRA 18:4)

1. Zhdanovskiy metallurgicheskiy institut.

LYUBOV, V.Ya. (Donetsk), MOROZOV, M.A. (Donetsk)

Large-unit replacement and lifting system of electrical locomotive repair. Zhel. dor. transp. 47 no.3:38-41. Mar '65. (MIRA 18:5)

1. Zamestitel' nachal'nika sluzhby lokomotivnogo khozyaystva Donetskoy dorogi (for Lyubov). 2. Glavnyy inzh. sluzhby lokomotivnogo khozyaystva Donetskoy dorogi (for Morozov).

LYUBOV, V.Ya., inzh.; NECHAYEVSKIY, M.R., inzh.; SMUSHKOV, P.I.,
inzh., red.; MEL'NIKOV, V.Ye., red.; VOROB'YEVA, L.V.,
tekhn. red.

[Repair of locomotives on hoists; experience of the
Donetsk Railroad] Pod"emochnyi remont parovozov; opyt
Donetskoi dorogi. Moskva, Transzheldorizdat, 1963. 53 p.
(MIRA 17:2)

L 9698-66 EWT(m)/EWP(j)/T RPI WY/SM
ACC NR: AP5026526 SOURCE CODE: UR/0286/65/000/019/0069/0069

AUTHORS: ^{44,55} Burshteyn, V. Kh.; ^{44,55} Lyubova, O. A.

46
B

ORG: none

TITLE: Method for improving ¹⁵ impact stability of plastics. Class 39, No. ¹⁵ 175222

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 19, 1965, 69

TOPIC TAGS: plastic, polymer, teflon, styrene, plastic filler ^{44,55}

ABSTRACT: This Author Certificate presents a method for improving the impact stability of plastics made by copolymerizing styrene with α -methylstyrene and a polymeric filler. ¹⁵ The filler is incorporated into the polymer by a hot rolling process. To obtain plastics suitable for use at high frequencies (up to 10^{10} cycles/sec), polytetrafluorethylene in quantities of 20--30 wt % is used as filler.

SUB CODE: 11/ SUBM DATE: 18Jan62


Card 1/1

UDC: 678.747.22-13+678.046.7.002.2

ACC NR: AP6029051

(A)

SOURCE CODE: UR/0413/66/000/014/0080/0080

INVENTORS: Kudryayevtsev, G. I.; Tokarev, A. V.; Oitis, S. S.; Ivanova, V. M.;
Seina, Z. N.; Lyubova, T. A.; Nemlova, S. A.

ORG: none

TITLE: A method for obtaining modified polyethyleneterephthalate. Class 39,
No. 183936 [Announced by All-Union Scientific Research Institute of Synthetic Fibers
(Vsesoyuznyy nauchno-issledovatel'skiy institut iskusstvennogo volokna)]

SOURCE: Izobret prom obraz tov zn, no. 14, 1966, 80

TOPIC TAGS: ~~polymer~~ polyethylene, ~~plastic~~, chemical synthesis

ABSTRACT: This Author Certificate presents a method for obtaining a modified
polyethylene terephthalate by introducing modifying ingredients in the course of its
synthesis. To increase the heat resistance of the polymer and of its products,
the bifunctional derivatives of pyromellitimide (for instance, N,N¹-(bis-ethoxy)py-
romellitimide or N,N¹-bis-acetylpyromellitimide is used as the modifying addendum.

SUB CODE: 11/

SUBM DATE: 02Jul65

Card 1/1

LYUBOVETSKIY, I.

Work on methods in a school of combined studies. Prof.-tekh.obr.
19 no.10:30-31 0 '62. (MIRA 15:11)

1. Zamestitel' direktora uchebno-kursoвого kombinata tresta
"Magnitostroy".
(Kursk Province--Building trades--Study and teaching)

LYUBOVETSKIY, I.

Conducting the demonstration lessons. Prof.-tekh.obr. 20 no.10:
31 0 '63. (MIRA 16:12)

1. Ispolnyayushchiy obyazannosti direktora uchebno-kursovogo
kombinata tresta "Magnitostroy", Chelyabinskaya obl.

LYUBOVICH, L. A., Engineer

"Operating Memory Device Employing Cathode Ray Storage Tubes in the BESM" a paper presented at the Conference on Methods of Development of Soviet Mathematical Machine-Building and Instrument-Building, 12-17 March 1956.

Translation No. 596, 8 Oct 56

LYUBOVICH, L.A.

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Laut, V.N., and Lyubovich, L.A.

Zapominayushcheye ustroystvo na elektronno-luchevykh trubkakh bystrodeystvuyushchey elektronnoy schetnoy mashiny Akademii Nauk SSSR (Cathode-Ray Tube Memory Device in the High-Speed Electronic Computer of the Academy of Sciences, USSR) Moscow, Izd-vo AN SSSR, 1957. 88 p. 5500 copies printed.

Sponsoring agency: Akademiya Nauk SSSR. Institut tochnoy mekhaniki i vychislitel'noy tekhniki.

Responsible Ed.: Lebedev, S.A., Member of the Academy; Ed. of the Publishing House: Kudashev, A.I.; Tech. Ed.: Moskvicheva, N.I.

PURPOSE: This book is published to present the results of work done at the Academy of Sciences, USSR, in developing and designing a high-speed electronic computer and, in particular, its memory devices. This monograph is intended for specialists in computing machines.

COVERAGE: The Academy of Sciences high-speed electronic computer (BESM) and its internal memory device (VZU) both operate in parallel, which permits computation speeds much higher than those obtainable with memory devices operating in series. Three basic types of cathode-ray tubes (CRT) were investigated for

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Cathode-Ray Tube Memory Device (Cont.)

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use as electrostatic storage tubes: 1) Ordinary oscillotrons. 2) Cathode-ray tubes with internal regenerative feedback. 3) A special barrier-grid storage tube developed by the Ministry of Radio Engineering and designated the LN-1 "potentsialoskop". This tube contains an aluminum backplate covered with a dielectric coating consisting of an aluminum dioxide film, a barrier grid placed at a distance of 0.2 mm from the backplate, and a collector consisting of a circular conducting aquadag coating on the inside glass surface of the tube. The operation of the tube is based on the utilization of secondary electron emission with a secondary-emission ratio $\sigma_e^{\text{max}} > 2$. The ordinary oscillotrons (1) were found to be the cheapest from the point of view of production and to have a long life, but they have low resolution, greater screen nonuniformity, low output signal level and a lower stability caused by current drift. The CRT with internal regenerative feedback (2) can be operated without external feedback; however, these tubes are more complicated to produce and control than the other two types. The LN-1 tube (3) was found to be comparatively simple to produce and to have a simple writing and reading control system; its output signal is of an order larger than that of the other two types of tubes, it has greater resolution and lower dynamic range between signal and noise. These advantages determined the final structural development and serial production of this type of tube.

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Cathode-Ray Tube Memory Device (Cont.)

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The following are some of the basic parameters of the LN-1 storage tubes (under testing conditions established by the Ministry of Radio Engineering Industry): 1) The useful number of storage elements is 1024 with 400 scannings permissible in neighboring elements without regeneration of the input signal stored at a particular element (100 writings and 100 readings of "1" and 100 writings and 100 readings of "0"). 2) The capacity-discharge reading time of a particular element is 5 μ sec. 3) The signal current is about 10 μ a. 4) The beam-deflection sensitivity is 0.35 mm/v. The deficiencies of LN-1 storage tubes are as follows: 1) For beam positioning necessary in the selection of a particular target element a strictly determined potential is required which, in turn, requires a high quality of power supply. 2) The same strict quantitative requirement applies to writing code differentiation ("1" from "0"). 3) The retention time of a stored charge pattern is comparatively low. 4) The large dynamic range between the reading and writing signals leads to a loss of sensitivity of the reading amplifier. The BESM has the following basic parameters: 1) it contains 39 operating and 9 reserve memory sets; 2) each set has 1024 storage elements; 3) the maximum operating frequency is 80 kc; 4) the permissible number of scannings in neighboring elements (when writing "1" in them) without regeneration of the input signal stored at a particular element, is 500; 5) there are 1073 vacuum tubes,

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Cathode-Ray Tube Memory Device (Cont.)

97

431 diodes and 39 special CRT of the LN-1 type; of these, 200 vacuum tubes and 112 diodes are used only in the control device; 6) there are 378 blocks standard for the BESM, and 7) 240 standard VZU blocks. The use of interchangeable standard blocks in the VZU increased somewhat the number of tubes but made the production and the operation of the computer easier. Almost all vacuum diodes can be replaced by semiconductors. According to the authors, the VZU developed by the Academy can be compared in speed of operation with similar devices of foreign construction, for example with the IBM-701. Also, the permissible number of readings without regeneration is 500 for the VZU, more than 3 time greater than the 148 of the IBM-701 memory device. The VZU also has decided advantages over the high-speed M-2 computer of the Power Engineering Institute, AS USSR, which is equipped with oscillograms, with 512 storage elements and 170 permissible readings from a particular element without erasing information stored in adjacent elements. A new type of "potentialoskop," the LN-4, makes it possible to obtain four times as many memory elements and twice as many readings without regeneration as can be obtained with the LN-1. There are possibilities of further improvement in this type of CRT, which is not true of ordinary oscillograms. These CRT have the disadvantage of shorter life (1000 to 2000 hrs) and higher cost, because until recently they were produced in the laboratory, and industrial production started only recently and in small quantities. This

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Cathode-Ray Tube Memory Device (Cont.)

97

disadvantage is compensated by the fact that one LN-4 tube can provide the same number of memory elements as 8 oscillotrons. The high-speed operation of these tubes is expected to exceed 100 to 120 kc, and this is why in the very high-speed computers requiring 100 to 200 thousand operations per sec and a large storage volume only this special type of tube can be applied. The VZU was developed by a group of engineers under the supervision of the chief designer of the BESM, S. A. Lebedev, Member of the Academy. The following engineers worked on the project: V. N. Laut and L. A. Lyubovich (authors of the monograph), I. D. Vizun, A. V. Avayev and V. S. Mitrofanov. Engineers O. K. Shcherbakov and Yu. I. Vizun participated in the development of stabilized power supplies. The authors thank the following persons for help in preparing the monograph: A. M. Litvinov and Ye. I. Mamonov, Candidates of Technical Science, and A. Ya Tyurin, V. A. Mel'nikov and A. N. Zimarev, engineers. According to the authors, the problem of development of the potentials which an insulated target element or a free electrode will acquire under the influence of electron bombardment was first investigated in 1935 by S. I. Katayev (p. 15). The monograph is illustrated by photography, oscillograms, connection diagram, graphs and drawings. There are 12 references, of which 8 are Soviet (including 2 translations) and 4 English.

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PHASE I BOOK EXPLOITATION

SOV/5605

Lyubovich, L.A., and Yu. S. Ryabtsev

Elementy bystrodeystvuyushchey vychislitel'noy mashiny na tranzistornykh pereklyuchatelyakh toka (Transistorized Current-Switching Components of High-Speed Digital Computers) Moscow, 1960. 59 p. 600 copies printed. (Series: Elektronnyye vychislitel'nyye mashiny)

Sponsoring Agency: Institut tochnoy mekhaniki i vychislitel'noy tekhniki Akademii nauk SSSR.

No contributors mentioned.

PURPOSE: This book is intended for technical personnel concerned with computing techniques.

COVERAGE: Operating principles of current changeover switches are given. Construction of high-speed logical and memory units and main circuits on such switches is discussed, with circuit constructions on drift transistors P-401 and P-405 outlined in detail. Transient processes in switches are considered, and experimental data from tests of components and complex

Card 1/3

Transistorized Current-Switching Components (Cont.)

SOV/5605

Circuits are given. The requirements for circuit components are discussed. No personalities are mentioned. There are 12 references: 8 English and 4 Soviet.

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LY KOVICH, L.A.

The Cathode ray tube memory of the high speed electronic computer of the U.S.S.R. Academy of Sciences, V.I. Latt and L.A. Lykovich. London, New York, Pergamon Press, 1960.

XI, 90 p. II us., Diagrams, Graphs, Tables.

Translated from the original Russian: Zapominayushcheye ustroystvo na elektronolyucheykh trubkakh bystrodeystvuyushey elektronnoy schetnoy mashiny Akademii Nauk SSSR, Moscow, 1957.

At head of title: Akademiya Nauk SSSR. Institut Tekhnicheskoy Mekhaniki i Vychislitel'noy Tekhniki.

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GALETSKIY, F.P.; LYUBOVICH, L.A.,

[Univibrator using a tunnel diode for ~~computer circuits~~]
Odnovibrator na tunnel'nom diode v skhemakh vychisli-
tel'noi tekhniki. Moskva, Akad. nauk SSSR, 1965. 67 p.
(MIRA 19:1)

L 7960-66 ENT(1)/EWA(h)

ACC NR: AP5025734

SOURCE CODE: UR/0286/65/000/018/0086/0087

AUTHORS: Galetskiy, F. P.; Lyubovich, L. A.

ORG: none

TITLE: Bipolar ²⁵pulse shaper of tunnel diodes. Class 42, No. 174828

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 18, 1965, 86-87

TOPIC TAGS: pulse shaper, tunnel diode

ABSTRACT: This Author Certificate presents a bipolar pulse shaper of tunnel diodes. To simplify the device, one pair of like electrodes of the tunnel diodes is connected together and through an inductance coil to the voltage supply (see Fig. 1). The first electrode of the other pair is connected to the common bus. The second is connected through an inductance coil to the input divider resistor.

Card 1/2

UDC: 681.14-523.8

I. 7960-66

ACC NR: AP5025734

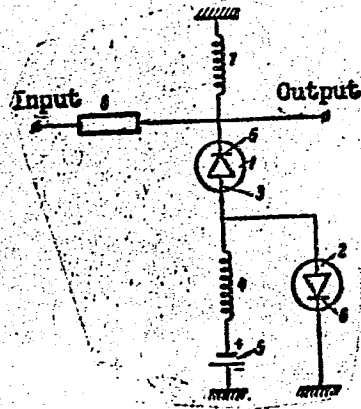


Fig. 1. 1 and 2- tunnel diodes; 3- first pair of like electrodes; 4- inductance; 5- power supply; 6- second pair of like electrodes; 7- inductance; 8- input divider resistance

Orig. art. has: 1 diagram.

SUB CODE: EC/

SUBM DATE: 24Jan64

PC
Card 2/2

I. 10074-67 EMT(d)/EWF(1) IJP(c) BB/GG
ACC NR: AP6029945

SOURCE CODE: UR/0413/66/000/015/0110/0111

56

INVENTORS: Galetskiy, F. P.; Lyubovich, L. A.

ORG: none

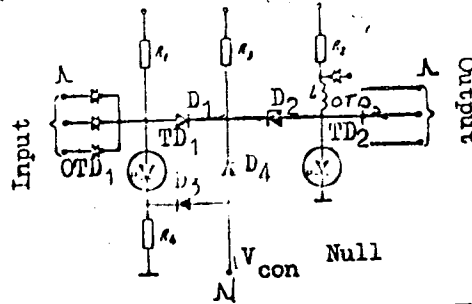
TITLE: A "not-or" logic element using tunnel diodes and a diode with an accumulated charge. Class 42, No. 184521

SOURCE: Izobret prom obraz tov zn, no. 15, 1966, 110-111

TOPIC TAGS: logic element, computer component, tunnel diode, tunnel diode storage

ABSTRACT: This Author Certificate presents a "not-or" logic element using tunnel diodes and a diode with an accumulated charge. The logic element consists of a storage cell and an output shaper (see Fig. 1).

Fig. 1. OTD₁, OTD₂ - reversed tunnel diodes; R₁, R₂, R₃, R₄ - resistors; TD₁, TD₂ - tunnel diodes; D₃ - diode with an accumulated charge; D₁, D₃, D₄ - diodes; L - inductance



UDC: 681.142.07

Card 1/2

L 10074-67

ACC NR: AP6029945

The design increases the noise-free nature of the element and simplifies its construction. The tunnel diode of the storage cell is connected with the grounded strip through a resistor. Pulses for "null" setting are fed to the resistor. Orig. art. has: 1 figure.

SUB CODE: 09/ SUBM DATE: 20Apr65

Card 2/2 *477*

LYUBOVICH, V. A.

Medicine.

"The Problem of Early Diagnosis of Amyloidosis,"

SO: Prob. Tuber., No. 5, 1949. Mbr., Osteo-Surgical Dept., Moscow Oblast Sci. Res.
Inst. of Tuberculosis, -c1949-.

1. SOKOLINSKYI, D. A., Docent; LEVIN, C. I.; LYUBOVICH, V. I.; FEHTIN, M. B.;
PTUKHA, E. M.; SORCHKINA, S. N.
2. USSR (600)
4. Influenza
7. Cardiovascular system in grippe, Medych. zhur., 22, no. 1, 1952.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

USSR / Human and Animal Physiology. Digestion, Pancreas.

T

Abs Jour : Ref Zhur - Biol., No 15, 1958, No. 70290

Author : Lyubovich, V. I.

Inst : Kiev Medical Institute imeni A. A. Bogomolets

Title : The Functional State of the Pancreas (External Secretory Functions) in Hypertension

Orig Pub : Avtorof. dis. kand. med. n., Kievsk. med. in-t. im.
A. A. Bogomol'tsa, 1957

Abstract : No abstract given

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GLUKHEN'KIY, T.T., prof.; LYUBOVICH, V.I., kand.med.nauk (Kiyev)

"Acute and subacute dystrophy of the liver" [in Ukrainian] by E.S.
Brusilovskii. Reviewed by T.T. Glukhenkii, V.I. Liubovich. Vrach.
delo no.9:999-1000 S '59. (MIRA 13:2)

(LIVER--DYSTROPHY)
(BRUSILOVSKII, E.S.)

LYUBOVICH, V.I.

Treatment of angina pectoris and prevention of coronary thrombosis with valhepar. Kardiologiya no.1:57-60, 1966.

MSA 11 10

1. Kafedra terapii (zav.- prof. T.I. Glukhen'kiy) restavratsionnogo fakul'teta Kiyevskogo meditsinskogo instituta.

Lyubovich, E.M.

Respiration of fat tissue devoid of vitamin A. K. M. Leuts'ki and E. M. Lyubovich (State Univ. Chernovitsi, Ukr. S.S.R.). ORIGIN: Biochim. Zhur. 24, 172-5 (1954); cf. C.A. 41, 8047c. — By manometric methods it was shown how vitamin A depletion affects O₂ consumption by brain, liver, kidney, and muscle, representing tissues of varied storage and requirements of vitamin A. White rats, 70-g. wt., were used. Tissues were minced on ice and 100-mg. portions placed in Ringer-phosphate, pH 7.3, and O₂ uptake noted. The rats were divided into 3 groups: (1) controls, (2) deprived of vitamin A for 2 months, and (3) with vitamin A for 10-12 days after 2 months' deprivation. Results are (in cu. mm. of O₂/100 mg. raw tissue/hr.): (1) brain 234; liver 150; kidney 342; muscle 42.9; (2) brain 302; liver 210; kidney 414; muscle 37.1; (3) brain 241; liver —; kidney 307; muscle —. Vitamin A absorbs O₂ and catalyzes oxidation of unsatd. fatty acids, from which it might be expected that O₂ consumption would be decreased by vitamin A exclusion. However, when vitamin A is given to avitaminotic rats, the O₂ consumption in brain, kidney, and liver actually increases. Chayton P. Hoban.

-Chem. Biochemistry

①

LYUBOVICH, E. N.

USSR/Biochemistry

Card 1/1

Authors : Leutskiy, K. M., and Lyubovich, E. N.

Title : Content of phosphatides and unsaturated fatty acids in connection with the change of acidifying processes in tissues of rats during vitamin A deficiency.

Periodical : Dokl. AN SSSR, 96, Ed. 2, 341 - 342, May 1954

Abstract : Tests on young white rats showed that the phosphatide content changes sharply during vitamin A deficiency in the kidneys, lungs and brain and does not change in the liver and muscles. As is known the kidneys and lungs are more affected by A-avitaminosis than are other tissues. The phosphatide content in the kidneys increases to 91%, in the lungs to 73% and in the brain to 31%. Four references; 1 USSR. Tables.

Institution : State University, Chernovitsy, Ukr-SSR

Presented by : Academician A. I. Oparin, March 5, 1954

LYUBOVICH, E.N.

Disturbances in cholesterol metabolism in vitamin A deficiency. K. M. Lents'ki and E. N. Lyubovich (State Univ., Chernovtsy). *Doklady Akad. Nauk S.S.S.R.* 104: 280-2 (1955). Expts. with white rats under conditions of A. avitaminosis showed the reduction of content of cholesterol in brain, liver, and especially in adrenals. Kidneys showed no significant change. Tests with β -aminobenzoic acid showed that the exptl. animals are able to acetylate this acid readily, so that there was no deficiency in cholesterol precursor. Considerable cholesterol loss takes place in the exptl. animals via intestinal excretion. G. M. Kosolapoff

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Changes in the hormonal activity of the adrenal cortex in
vitamin A deficiency. Nauch.dokl.vys.shkoly;biol.nauki no.3:
90-92 '58. (MIRA 11:12)

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Impairment of cholesterol metabolism in vitamin A deficiency
[with summary in English]. Vop.med.khim. 4 no.1:43-49 Ja-F'58
(MIRA 11:5)

1. Kafedra biokhimii Chernovitskogo gosudarstvennogo universiteta.
(VITAMIN A DEFICIENCY, experimental
eff. on cholesterol content of organs (Rus))
(CHOLESTEROL, metabolism
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LYUBOVICH Ye N. , GRIMALYUK A.I. (USSR)

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in Mitochondria for Various Tissues during Vitamin A Deficiency."

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Effect of water
in the liver and
29

... ..

LEUTSKIY, K. [Leuts'kyi, K.M.]; LYUBOVICH, Ye.N. [Liubovych, IE.M.]

Certain aspects of interrelation in the metabolism of ubiquinone,
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vitaminov Chernovitskogo gosudarstvennogo universiteta.

LYUBOVICH, Yu.O.; PUNSKIY, Ya.M., professor, retsenzent; KLI'CHENKO, K.I.
kandidat ekonomicheskikh nauk; FEDOTOV, H.P., redaktor; ANDEL'MAN,
S.Ya., redaktor; ALBUKOVA, Ye.S., tekhnicheskii redaktor

[Economics of a machine building plant] Ekonomika mashinostroitel'
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1948. 271 p. (MLRA 8:10)
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BARTASHEV, L.V.; KATS, B.I., inzh., retsenzent; PETRENKO, O.S., inzh.,
retsenzent; LYUBOVICH, Yu.O., kand. ekonom. nauk, red.;
ZUBKO, L.T., tekhn. red.

[Organization of intershop conveying] Organizatsia vnutri-
tsekhovogo transporta. Moskva, Mashgiz, 1950. 98 p.
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LYUBOVICH, YU. O., ed.

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The system and practice of supplying enterprises with technical materials. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1954. 298 p. (55-41076)

TA404.R9D6

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LYUBOVICH, Yu. O.
IVANOV, Nikolay Vasil'yevich; MALYUTIN, Nikolay Kuz'mich; FLEYSHMAN, Abram L'vovich; BURSHTEYN, I.I., retsenzent; LOBODIN, P.V., retsenzent; MOROZOV, A.N., retsenzent; LYUBOVICH, Yu.O., kandidat ekonomicheskikh nauk, redaktor; TEMKIN, A.V., redaktor izdatel'stva; UVAROVA, A.F., tekhnicheskiiy redaktor.

[Supply of materials and equipment in machinery manufacturing] Material'no-tekhnicheskoe snabzhenie v mashinostroenii. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1956. 275 p. (MLRA 10:4)
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AUTHOR: Lyubovich Yu.O. (Dotsent, Cand. Economic Sci.) 110-7-18/30

TITLE: Economics in the electrical industry and the organisation of industrial enterprises. (Ekonomika elektropromyshlennosti i organizatsiya promyshlennykh predpriyatiy).

PERIODICAL: "Vestnik Elektropromyshlennosti" (Journal of the Electrical Industry), Vol.28, No.7, 1957, pp.61-62 (USSR).

ABSTRACT: Number 9 of the journal for 1956 contained two articles on the study of economics and the organisation of production, one by Nelidov and the other by Peltsman and Kanevskii. Both articles were based on criticism of a recently issued textbook on the subject. This short article is a contribution to the discussion on these two articles. In his **original article** Nelidov considered it possible to unite into a single college course the courses on concrete economics and the organisation of production. Peltsman and Kanevskiy on the other **hand** considered that they should be treated separately. This article is a strong plea for the latter point of view.

ASSOCIATION: VZIST.

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[Saving ferrous metals in the national economy of the U.S.S.R.]
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red.

[Socialist labor contracts] Sotsialisticheskiy trudovoi dogovor;
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1. Zaveduyushchiy kafedroy otraslevykh ekonomik i prava za-
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SHEYN, Pavel Abramovich; LYUBOVICH, Yu., red.; CHEKHUTOVA, V., red.;
TROYANOVSKAYA, N., tekhn.red.

[The supply of materials and equipment for socialist industrial enterprises] Material'no-tekhnicheskoe snabzhenie sotsialisticheskogo promyshlennogo predpriatiia. Izd.2., perer. Moskva, Gos.izd-vo polit.lit-ry, 1959. 365 p. (MIRA 12:11)
(Industrial procurement)

YEFIMOV, A.N., glav. red.; BACHURIN, A.V., red.; VOLOBARSKIY, L.E., red.; GERSHBERG, S.R., red.; GI ZBURG, S.Z., red.; DUMBUKOV, G.F., red.; KIRZHIZ, D.M., red.; KLIMENKO, E.I., red.; KOMAROV, F.V., red.; KOROL'KOV, A.N., red.; KYLOV, P.N., red.; LIVANSKAYA, F.V., red.; LOKSHIN, E.Yu., red.; OSTROVITYANOV, K.V., red.; POSVYANSKIY, S.S., red.; PRUDELSKIY, G.A., red.; RAZUMOV, N.A., red.; RUMYANTSEV, A.F., red.; TATUR, S.K., red.; SHUKHGAL'TER, L.Ya., red.; BAZAROVA, G.V., starshiy nauchnyy red., kand. ekon. nauk; KISEL'MAN, S.M., starshiy nauchnyy red.; GLAGOLEV, V.S., nauchnyy red.; TUMANOVA, N.L., nauchnyy red.; BLAGODARSKAYA, Ye.V., mlad. red.; SHUSTROVA, V.M., mladshiyy red.; GAYDUKOV, Yu.A., kand. ekon. nauk, red.; ZBARSKIY, M.I., red.; LOZVOY, Ya.D., red.; SERGEYEV, A.V., dots., red.; KHEYFETS, L.M., kand. tekhn. nauk, red.; LYUBOVICH, Yu.O., kand. ekon. nauk, red.; SYSOYEV, I.V., red.; KOSTI, S.D., tekhn. red.

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BRAGINSKIY, Lev Iosifovich, kand. ekon.nauk [deceased]; ZHURAVLEV,
A.N., kand.tekhn.nauk, retsenzent; LYUBOVICH, Yu.O., kand.
ekon.nauk, red.; ANTIPOV, V.P., red.izd-va; VLADIMIROVA,
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LYUBOVICH, Yuriy Osipovich; LOKSHIN, E.Yu., doktor ekon. nauk, retsenzent; LETENKO, V.A., kand. ekon. nauk, retsenzent; TURETSKIY, I.L., retsenzent; FASOLYAK, N.D., kand. ekon. nauk, retsenzent; YAKOBI, A.A., kand. ekon.nauk, retsenzent; LEFNIKOVA, Ye., red.

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