A Method for the Interpolation of Functions by Means of Exponential Polynomials and Its Application in the Synthesis of Electric Circuits

S/108/60/015/008/009/010/XX
B019/B063

is taken to be the solution of a homogeneous differential equation $a_0 \Phi(x) + a_1 \Phi^{(1)}(x) + \ldots + a_{n-1} \Phi^{(n-1)}(x) + \Phi^{(n)}(x) = 0$. Using this differential equation, a set of algebraic equations is obtained:

$$\begin{aligned} &a_0\psi_0 + a_1\psi_1 + \ldots + a_{n-1}\psi_{n-1} + \psi_n = 0 \\ &a_0\psi_1 + a_1\psi_2 + \ldots + a_{n-1}\psi_n + \psi_{n+1} = 0 \\ &\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ &a_0 + a_1 m + a_2 m^2 + \ldots + a_{n-1} m^{n-1} + m^n = 0 \end{aligned} \qquad (6)$$

Thus, it is possible to determine $\Phi(x)$ and represent $\psi(t)$ as follows:

$$\psi(t) = \sum_{k=1}^{n} C_k e^{p_k t} = \frac{1}{W_n} \begin{vmatrix} 1 & 1 & \ldots & 1 & -\psi_0 \\ m_1 & m_2 & \ldots & m_n & -\psi_1 \\ \ldots & \ldots & \ldots & \ldots & \ldots \\ m_1^{n-1} & m_2^{n-1} & \ldots & m_n^{n-1} & -\psi_{n-1} \\ e^{p_1 t} & e^{p_2 t} & \ldots & e^{p_n t} & 0 \end{vmatrix} \qquad (9)$$

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77473
SOV/103-21-1-3/22

AUTHOR: Kochanov, N. [illegible] (Leningrad)

TITLE: On the Connection Between Transfer Functions of Linear Systems and Their Laplace Representations

PERIODICAL: Avtomatika i telemekhanika, 1960, Vol 21, Nr 1, pp 20-28 (USSR)

ABSTRACT: In the study a method is given of using recurrent expressions and of doubling the pitch of discrete values in their application to the analysis of the discrete magnitudes of transfer functions. Definition of Problem. The numerical methods of solving transient state problems, based on discrete magnitudes of the transfer function, do not require any calculation of roots of the characteristic equation, or any graphical methods. Linear systems with lumped constants are being discussed. Transfer Function Representation. Let the impulse transfer function or the regular part of a transfer function of a system have a

Card 1/3

form of rational fraction, as follows:

$$F(p) = \frac{b_0 p^{n-1} + b_1 p^{n-2} + \cdots + b_{n-1}}{p^n + a_1 p^{n-1} + a_2 p^{n-2} + \cdots + a_n}. \qquad (1)$$

Series expansion of this fraction, with reference to the negative degrees of p, is given in the form:

$$F(p) = \frac{s_0}{p} + \frac{s_1}{p^2} + \frac{s_2}{p^3} + \cdots + \frac{s_k}{p^{k+1}} + \cdots \qquad (2)$$

Here coefficients $s_0, s_1, \ldots$ are the initial values of function $F(t)$ and they, [illegible] the following recurrent relations:

$$s_{k+n} + a_1 s_{k+n-1} + a_2 s_{k+n-2} + \cdots + a_n s_k = 0 \quad (k = 0, 1, 2, \ldots) \qquad (3)$$

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This equation is obtained from:

$$p^n + a_1 p^{n-1} + a_2 p^{n-2} + \ldots + a_n = 0 \qquad (4)$$

using the following system of correspondence between p and s symbols:

$$1 = p^0 \to s_0, \quad p \to s_1, \quad p^2 \to s_2, \ldots, p^i \to s_i, \ldots \qquad (5)$$

If the transfer function of the system is described by means of discrete magnitudes F_0, F_1, F_2,..., F_{2n-1},..., corresponding to equidistant values of the argument t, then the following series may be written:

$$\overline{F}(m) = \frac{F_0}{m} + \frac{F_1}{m^2} + \frac{F_2}{m^3} + \cdots + \frac{F_{2n-1}}{m^{2n}} + \ldots, \qquad (6)$$

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where $m = e^{p\tau}$ and τ is spacing of discrete values. Transforming this series into a continued fraction, a

fraction can be found which corresponds to this series:

$$\Phi(m) = \frac{B_0 m^{n-1} + B_1 m^{n-2} + \ldots + B_{n-1}}{m^n + A_1 m^{n-1} + A_2 m^{n-2} + \ldots + A_n}. \quad (7)$$

If the equidistant magnitudes $F_0, F_1, F_2, \ldots, F_{2n-1}$ are values of an exponential polynomial of the n-th order, then the equidistant magnitudes of the function may be obtained using the recurrent expression:

$$F_{n+l} + A_1 F_{n-1+l} + A_2 F_{n-2+l} + \ldots + A_n F_l = 0 \quad (l = 0, 1, 2, 3, \ldots). \quad (8)$$

This equation is obtained on the basis of:

$$m^n + A_1 m^{n-1} + A_2 m^{n-2} + \ldots + A_n = 0 \quad (9)$$

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On the Connection Between Transfer Functions of Linear Systems and Their Laplace Representations

SOV/103-21-1-3/12

using special expressions of correspondence between the m and F symbols. Thus, the problem may be solved of extrapolation of exponential polynomials determined by 2n equidistant values. Method of Developing the Recurrent Equation for Equidistant Magnitudes of the Time Function. The approximate method of determining the A-parameters of Eq. (3) is discussed. Equation (9) represents a combination of roots e^{p_k} Making a similar combination of roots $e^{2p_k\tau}$, the equation for doubling the pitch of discrete values is obtained. The coefficients of the transformed equation are determined by means of N. I. Lobachevski's method for solving high-order algebraic equations. The equation for the doubling of the pitch is:

$$m^{2n} + A_1^{(1)} m^{2n-1} + A_2^{(1)} m^{2n-2} + \ldots + A_{2n}^{(1)} = 0$$

Card 5/8

and the recurrent expression is in the form:

$$F_{n+1} + A_1^{(1)} F_{n-1+1} + A_1^{(2)} F_{n-1+1} + \cdots + A_1^{(n)} F_1 = 0.$$

In these equations the quantity $A^{(1)}$ is a combination of several A-quantities. Using the doubling method several times, it is possible to increase by 4,8,16 times the pitch of discrete values without lowering the accuracy of the recurrent expressions. The initial equidistant magnitudes of the looked-for time function are discussed. Transient state calculation is given on an example of an electrohydraulic servosystem under the influence of a single step function. A Laplacian transform of this function is:

$$\bar{F}(p) = \frac{0{,}005\,p^2 + 0{,}37\,p + 2{,}5}{p\left[p^4 + 88\,p^3 + 2365\,p^2 + 18250\,p + 68000\right]}$$

3 6/8 Method of Determination of the Denominator of the

On the Connection Between Transfer Functions of Linear Systems and Their Laplace Representations

77472
SOV/103-21-1-3/22

Representation of the Approximating Function. A Laplace transformed function must be derived expressing the exponential polynomial used to approximate the temporary characteristic of the system. Let the temporary characteristic be approximated by an exponential polynomial at 2n equidistant nodes of interpolation. Then function (7) may be found. By means of this function an arbitrary number of equidistant values of the n-th order exponential polynomial may be determined. To this purpose this function may be expanded into a series of negative m-orders, or else the recurrent equation (8) may be applied. The relationship between symbols A and a is found, where a are coefficients of the characteristic equation (4). Method of Determination of the Numerator of the Transformed Function. To this purpose series are used, the coefficients of which are initial values of the looked-for approximating function and of its

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derivatives, or else initial moments of this function. An example illustrating the proposed method is given. In conclusion, the author says that: (1) A method is given of calculating the transient states by means of recurrent equations obtained using the approximate expressions for the operator of differentiation and the method of doubling the pitch of discrete values. The method gives a high degree of accuracy. (2) The method is given of obtaining Laplace transformed functions corresponding to exponential polynomials which interpolate the given temporary characteristics at equidistant nodes. This method may be used for graphically given functions. There are 4 references, 2 Soviet, 2 U.S. The U.S. references are: Boxer, R., Thaler, S., A Simplified Method of Solving Linear and Nonlinear Systems, PIRE, Nr 1, 1956; Boxer, R., A Note on Numerical Transform Calculus, PIRE, Nr 10, 1957.

SUBMITTED: April 23, 1959
Card 8/8

KOCHANOV, N.S.

Method of interpolating functions using exponential polynomials and application of this method to problems of the synthesis of time characteristics of electric networks. Radiotekhnika 15 no.8:51-66 Ag '60. (MIRA 13:8)

(Electric networks)

S/142/60/003/004/009/013
E192/E382

AUTHOR: Kochanov, N.S.

TITLE: Interpolation of a Periodic Train of Rectangular Pulses

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Radiotekhnika, 1960, Vol. 3, No. 4, pp. 506 - 508

TEXT: A periodic train of rectangular pulses (Fig. 1) is to be approximated by a trigonometric polynomial. A sequence of values of a given function corresponding to the equidistant values of t can be written as: $F_0 = F_1 = 1$, $F_2 = 2$, ... $F_{2n} = 1$, $F_{2n+1} = 0$, $F_{2n+2} = -1$ ... From these values of the function it is possible to construct a fraction which is in the form of:

$$\bar{\Phi}(m) = \frac{m^{4s-2} + m^{4s-4} + \ldots + m^2 + 1}{m^{4s} - m^{s-1} + m^{4s-2} - \ldots - m + 1} \qquad (1)$$

Card 1/4

Interpolation of a ....

Since the zeros of the denominator of this fraction are known, Eq. (1) can be written as:

$$\Phi(m) = \sum_{\kappa=1,3,5}^{2n-1} \frac{\frac{4}{2n+1}\cos^2\frac{\pi\kappa}{2(2n+1)}}{m^2 - 2m\cos\frac{\pi\kappa}{2n+1} + 1} . \qquad (2) .$$

From this it is possible to determine a trigonometric polynomial which interpolates the train of rectangular pulses. This is given by:

$$f_1(t) = \sum_{\kappa=1,3,5}^{2n-1} \frac{2}{2n+1}\operatorname{ctg}\frac{\pi\kappa}{2(2n+1)} \cdot \sin\kappa\omega_0 t . \qquad (3) ,$$

where n is the number of the terms in the polynomial. If the interpolation nodes are chosen differently, the fractional function can be written in the form:

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Interpolation of a ....

$$\Phi(m) = \sum_{\kappa=1,3,5}^{2n-1} \frac{\frac{4}{2n+1}\cos^3\frac{\pi\kappa}{2(2n+1)}}{m^2 - 2m\cos\frac{\pi\kappa}{2n+1} + 1} \qquad (4)$$

and the corresponding trigonometric polynomial is given by:

$$f(t) = \sum_{\kappa=1,3,5}^{2n-1} \frac{2}{2n+1} \operatorname{ctg}\frac{\pi\kappa}{2(2n+1)} \cos\frac{\pi\kappa}{2(2n+1)} \sin\kappa\omega_0 t. \qquad (5).$$

Fig. 2 shows a graph of Eq. (5) for n = 4 ; the figure also shows the form of the first four Fourier terms (see the dotted curve in the figure). By using Eq. (4) it is possible to construct a bipole for producing rectangular pulses. There are 4 figures and 3 Soviet references.

Card 3/5

S/142/60/003/004/009/013
E192/E382

Interpolation of a ....

ASSOCIATION: Kafedra Akademii svyazi (Chair of the Communications Academy)

SUBMITTED: June 4, 1959 (initially)
February 29, 1960 (after revision)

Card 4/5

KOCHANOV, N. S. Doc Tech Sci -- " Study of the problems of analysis and synthesis of linear electric circuits with lumped constants in a time region." Len, 1961 (Min of Higher and Secondary Specialized Education RSFSR. Len Electrical Engineering Inst im V. I. Ul'yanov(Lenin)).(KL, 4-61, 194)

KOCHANOV, M.S.

Methodology for constructing tables for use in calculating the transfer characteristics of electrical filters. Elektrosviaz' 16 no.9:53-58 S '62. (MIRA 15:9)
(Electric filters) (Radio filters)

SOBENIN, Yakov Andreyevich; KOCHANOV, N.S., otv. red.; VIZIROVA, V.V., red.; CHURAKOVA, V.A., tekhn. red.

[Design of multinomial filters] Raschet polinomial'nykh fil'trov. Moskva, Sviaz'izdat, 1963. 207 p. (MIRA 16:7)
(Electric filters) (Radio filters)

KOCHANOV, N.S.

Synthesis of linear electrical networks in respect to time; approximation problem. Elektrosviaz' 19 no.9:17-23 S '65.
(MIRA 18:9)

KOCHANOV, N.S.

Approximation of given time functions using exponential polynomials. Radiotekhnika 20 no.5:10-19 My '65.

(MIRA 18:10)

1. Deystvitel'nyy chlen Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi imeni Popova.

KOCHANOV, N.YE. Cand Vet Sci -- (diss) "Study of the functional state of the cardiovascular system and the blood indicators and urine in highly productive cows of 2nd, 3rd and 4th calving under concentrate types of feeding." Mos, 1959. 21 pp (Mos Vet Acad of the Min of Agr RSFSR), 160 copies

(KL, 49-59, 142)

KOCHANOV, N. E., (Candidate of Veterinary Sciences, Komi Branch of the Academy of Sciences USSR)

Methods of determination of acidity and alkalinity of cattle urine and their correlation

Veterinariya vol. 38, no. 9, September 1961, pp. 81.

KOCHANOV, N.Ye., kand. veter. nauk

Methods for determining the acidity and alkalinity of the urine of cattle and finding their relationship. Veterinariia 38 no.9:81-82 S '61. (MIRA 16:8)

1. Komi filial AN SSSR.

TIKHOMIROVA, Angelina Yevgen'yevna; TIKHOMIROV, Petr Leonidovich. Prinimal uchastiye KOCHANOV, P.D., nauchnyy sotrudnik. YARYSHEV, B.P., kand.tekhn.nauk, nauchnyy red.; TOKAREVA, T.N., vedushchiy red.; FRUMKIN, P.S., tekhn.red.

[Specialized course in electrical engineering, radio engineering, and electronics] Spetsial'nyi kurs elektrotekhniki, radiotekhniki i elektroniki. Leningrad, Gos.nauchno-tekhn.izd-vo neft. i gorno-toplivnoi lit-ry, Leningr.otd-nie, 1960. 483 p.

(MIRA 13:12)

1. Kafedra rudnoy geofiziki Leningradskogo gornogo instituta im. G.V.Plekhanova (for Kochanov).

(Electric engineering)

KOCHANOV, P.D.

Using the method of amplitude-phase measurements to select the parameters of apparatus. Geofiz. prib. no.9:94-99 '61. (MIRA 15:11)
(Electromagnetic prospecting—Equipment and supplies)

KOCHANOV, P.D.

Construction of induction magnetic transducers for electric prospecting apparatus. Geofiz. prib. no.19:86-92 '64.
(MIRA 18:9)

KOCHANOV, P.D.

Selecting the optimal loop size for the exploration of a spherical ore body. Zap. LGI 46 no.2:111-112 '63.
(MIRA 17:6)

KOCHANOV, V.R.

Device for X-ray examination of the foot and the ankle joint in standard conditions. Vest. rent. i rad. 36 no.6:43-44 N-D '61. (MIRA 15:2)

1. Iz fotolaboratorii (zav. V.R.Kochanov) Novosibirskogo nauchno-issledovatel'skogo instituta travmatologii i ortopedii (dir. - dotsent D.P.Metelkin).
(FOOT--RADIOGRAPHY) (ANKLE BONE--RADIOGRAPHY)
(RADIOGRAPHY--EQUIPMENT AND SUPPLIES)

ARKHANGORODSKIY, A.G., kand.tekhn.nauk; KUCHANOV, Yu.P., insh.

Simulating the stability of flat span covers. Izvh. vys. ucheb. zav.; mashinostr. no. 10:48-55 '60. (MIRA 14:1)

1. Nikolayevskiy korablestroitel'nyy institut.
(Structural frames--Models)

35034
S/145/60/000/010/002/014
D262/D304

18.6100

AUTHORS: Arkhangorodskiy, A.G., Candidate of Technical Sciences and Kochanov, Yu.P., Engineer

TITLE: Modelling the stability of flat decks

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroyeniye, no. 10, 1960, 48 - 55

TEXT: The purpose of this study is to examine the possibility of determining the stability of decks on specially built modelling installations. The principle is based on the known relationship between loads and deformations of rods at the moment when their stability is disturbed. The utilization of the installation is based on the theory of similarity. The phenomenon of the loss of stability is described by the general equations

$$Ei_m \frac{\partial^4 y}{\partial x^4} + T_m \frac{\partial^2 y}{\partial x^2} = 0 \quad (\text{at } y = y_m) \qquad (1)$$

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Modelling the stability of flat decks

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$$b_m EI_n \frac{\partial^4 v}{\partial y^4} = EI_m \frac{\partial^2 v}{\partial x^2}\Big|_{x_n=0}^{x_n+0} - k_{mn} v\Big|_{\substack{x=x_n \\ y=y_m}} \quad (2)$$

$$U_n EI_n \frac{\partial^2 v}{\partial y^2} = \frac{\partial v}{\partial y} \quad \left(\begin{matrix}\text{at} \\ \text{when } x = x_n \\ y = 0 \text{ and } y = L\end{matrix}\right), \quad (3)$$

and

$$U_m EI_m \frac{\partial^2 v}{\partial x^2} = \frac{\partial v}{\partial x} \quad \left(\begin{matrix}\text{at} \\ \text{when } y = y_m, \\ x = 0 \text{ and } x = l\end{matrix}\right). \quad (4)$$

for the case shown in Fig. 1 (v - area, i - sectional moment of inertia of a longitudinal beam, I - sectional moment of inertia of a transverse beam, T - contracting force of a longitudinal beam, U - coefficient of yieldingness of elastic and fittings of a beam; indexes: m - successive number of a longitudinal beam, n - successive number of a transverse beam) the constants of similarity are given by

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Modelling the stability of flat decks

S/145/60/000/010/002/014
D262/D304

$$C_v = \frac{v}{v_e} \qquad C_{K_{mn}} = \frac{k_{mn}}{k_{emn}}$$

$$C_l = \frac{l}{l_e} \qquad C_{U_m} = \frac{U_m}{U_{em}} = \frac{U_{lm}}{U_{elm}}$$

$$C_L = \frac{L}{L_e} \qquad C_{U_n} = \frac{U_n}{U_{en}} = \frac{U_{Ln}}{U_{eLn}} \qquad (5)$$

$$C_{l_m} = \frac{l_m}{l_{em}} \qquad C_{T_m} = \frac{T_m}{T_{em}}$$

$$C_{l_n} = \frac{l_n}{l_{en}}$$

the conditions of similarity, derived from equations (1 - 4) are also given in equation form. The maximum size of the installation can be 1600 mm x 900 mm. The results obtained from a test show that the errors do not exceed 10 % in comparison with the theoretical calculations. It is stated that this method can be used on an equal footing with the existing methods of calculations and also could be

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Modelling the stability of flat decks

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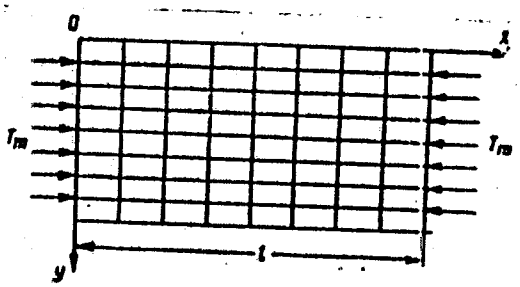
used to solve more involved problems, for example when longitudinal and transverse beams are not equidistant and their moments of inertia vary. There are 3 figures and 4 Soviet-bloc references.

ASSOCIATION: Nikolayevskiy korablestroitelnyy institut (Nikolayev Shipbuilding Institute)

SUBMITTED: December 26, 1959

Fig. 1.



(Рис. 1)

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S/145/62/000/002/005/009
D262/D308

AUTHORS: Arkhangorodskiy, A.G., Candidate of Technical Sciences, and Kochanov, Yu.P., Engineer

TITLE: Modelling of bending of frames with fixed joints

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Mashinostroyeniye, no. 2, 1962, 86 - 95

TEXT: The work principle of the new device designed by the author is based on the relationship between angles of rotation of joints and moments about the points of support of the frame rods. The conditions of similarity are studied and a detailed description of the device is given. A numerical example is given of design of a statically undeterminable flat frame. The error in design does not exceed 5 %. The device can be used in calculating ship frames and is recommended for laboratory work. There are 5 figures and 2 tables.

ASSOCIATION: Nikolayevskiy korablestroitel'nyy institut (Nikolayev Shipbuilding Institute)

SUBMITTED: December 26, 1959

Card 1/1

ARKHANGORODSKIY, A.G., kand.tekhn.nauk; KOCHANOV, Yu.P., inzh.

Modeling the bending of frames with fixed units. Izv.vys.ucheb.-zav.; mashinostr. no.2:86-95 '62. (MIRA 15:5)

1. Nikolayevskiy korablestroitel'nyy institut.
(Structural frames)

ACCESSION NR: AP4037114 S/0258/64/004/002/0368/0375

AUTHOR: Kochanov, Yu. P. (Nikolayev)

TITLE: Plane problem in elasticity theory for variable thickness plates

SOURCE: Inzhenernyy zhurnal, v. 4, no. 2, 1964, 368-375

TOPIC TAGS: plane elasticity, variable thickness plate, plane force, stressed state, rectangular plate

ABSTRACT: The author investigates the problem of the stressed state of plates of variable thickness, applicable to bulkheads, decks, etc. in ships. The plate is subjected to stresses in its plane. After deriving the basic equations which characterize the stressed state of the plate, the author gives the solution for rectangular plates of variable and graduated thicknesses. Orig. art. has: 4 figures and 33 formulas.

ASSOCIATION: none

Card 1/2

KOCHANOV, Yu.P. (Nikolayev)

Two-dimensional problem in the theory of elasticity for plates of variable thickness. Inzh. zhur. 4 no.2:[illegible] '64.
(MIRA 17:8)

ACC NR: AR6035382 (N) SOURCE CODE: UR/0398/66/000/009/A021/A021

AUTHOR: Kochanov, Yu. P.

TITLE: Equation of the plane problem of elasticity theory for stiffened rectangular plates of variable thickness

SOURCE: Ref. zh. Vodnyy transport, Abs. 9A129

REF. SOURCE: Sudostr. i morsk. sooruzh. Resp. mezhved. nauchno-tekhn. sb., vyp. 1, 1965, 13-16

TOPIC TAGS: compressed stiffened plate, elasticity theory, variational method, stress distribution, strain

ABSTRACT: The problem is solved by a variational method. Expressions are set up for the potential energy of the deformation of the plate and of the stiffeners, and expressions are obtained for the virtual work done by the external forces, under the assumption that the plate is acted on by volume forces and by forces applied to the stiffeners in the direction of the latter. The displacements U and V are determined on the basis of the principle of the possible displacements, according to which the force function should give a minimum in the equilibrium position. 1 illustration. Bibliography, 7 titles. Ye. Sukacheva. [Translation of abstract]

SUB CODE: 20

Card 1/1 UDC: 629.12:624.02/09

ACC NR: AT7004015 (N) SOURCE CODE: UR/3239/66/000/002/0094/0100

AUTHOR: Suslov, V. P.; Kochanov, Yu. P.

ORG: None

TITLE: On the problem of determining the loads on the bottom plates when a ship is launched from a longitudinal slip

SOURCE: Nikolayev. Korablestroitel'nyy institut. Sudostroyeniye i morskiye sooruzheniya, no. 2, 1966. Sudostroyeniye (Shipbuilding), 94-100

TOPIC TAGS: shipbuilding engineering, compressive stress, dynamic stress, stress distribution

ABSTRACT: An approximate method is proposed for determining the loads acting on the bottom plates of a vessel during launching from a longitudinal slip. The procedure is convenient from the computational standpoint and consideration is given within certain limits to structural flexure of the ship and to various other factors involving reactions of the launching ways in the second period. The reactions between the sliding and ground ways in the second period of the launching operation are given by the expression:

$$r(x) = r_0(x) + r(P, M, x),$$

Card 1/3

where s is the distance from the cross section of the ship passing over the threshold of the launching ways to the cross section being considered, $r(s)$ is the intensity of the reactions in the launching ways during the second period of the launching operation, $r_0(s)$ is the intensity of reactions in the launching ways after the vessel has been transferred from the building ways to the launching ways, $r(P, M, s)$ is the intensity of the reactions in the launching ways due to the concentrated force P and the concentrated moment M in the cross section of the ship passing over the threshold of the launching ways. Accuracy in determination of $r(s)$ by this formula depends basically on the degree of accuracy in determination of reactions $r_0(s)$ after transfer of the vessel to the launching ways. Experimental data on $r_0(s)$ for six ships with launch weights from 1500 to 4500 tons and lengths from 85 to 140 meters show that the actual distribution of these reactions differs considerably from the theoretical distribution based on representation of the vessel during launching as a girder on an elastic base under the effect of the launching load. Contrary to theoretical predictions, no significant reaction peaks were observed in any of the six experimental cases considered. Reactions of the launching ways after transfer may be considered approximately uniformly distributed on the section of these ways which is symmetric with respect to the center of gravity of the ship, giving the formula

$$r_0 \approx \frac{D}{l},$$

ACC NR: AT7004015

where D_c is the launch weight of the vessel and l is twice the distance from the center of gravity of the ship to the stern end of the unbroken section of the launching ways. This formula is used for derivation of equations expressing P and M and for finding the intensity of reactions r as a function of these two factors and the distance z. It is found that the curve for reactions of the launching tracks is fairly closely approximated by two types of loads: Q_1 uniformly distributed with respect to the length of the bottom plates and Q_2 with variation according to a triangular law over half the length of the bottom. Formulas are derived for calculating Q_1 and Q_2 and graphs are given for determining the coefficients appearing in these formulas. The formulas are recommended for practical calculations, especially in cases where the launching ways are not provided with girders under the keel and the continuous section is symmetric with respect to the center of gravity of the ship, providing measures are taken to assure uniform distribution of reactions in the launching ways after transfer of the vessel from its structural supports to the launching ways. Orig. art. has: 3 figures, 15 formulas.

SUB CODE: 13/ SUBM DATE: None/ ORIG REF: 005

Card 3/3

ACC NR: AT7004018 (N) SOURCE CODE: UR/3239/66/000/002/0113/0118

AUTHOR: Kochanov, Yu. P.; Spikhtarenko, V. N.

ORG: None

TITLE: On the strength of bottom plates during launching of ships

SOURCE: Nikolayev. Korablestroitel'nyy institut. Sudostroyeniye i morskiye sooruzheniya, no. 2, 1966. Sudostroyeniye (Shipbuilding), 113-118

TOPIC TAGS: shipbuilding engineering, yield stress, compressive stress, plastic deformation

ABSTRACT: The authors consider the problem of the strength of bottom plates during launching of ships from a longitudinal slip on ground ways with discontinuous wooden sliding ways. Expressions are derived for determining the compressive stresses in the sliding ways resulting in stresses equal to the yield stress of the material for the bottom plates. It is shown that compressive stresses of 10-12 kg/cm^2, which are average for sliding ways made from beams with a cross section of 25×25 cm, produce no plastic deformations in plates with a yield stress of 4000 kg/cm^2 and a thickness greater than 10-12 mm. However, thin plates may be subject to plastic deformations since compressive stresses in the sliding ways may exceed 10-12 kg/cm^2 during transfer of the ship from the building ways to the launching ways as well as in the second period of the launching operation. Plates thicker than 22 mm show no plastic deforma-

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ACC NR: AT7004018

tion since the yield stress of 4000 kg/cm^2 is reached at compressive stresses greater than the yield stress of the pine timbers used in the sliding ways. The effect of the spaces between the timbers on stresses in the plates shows up only in the case of extremely thin plates (5 mm in thickness or less) and may be disregarded since these plates are subjected to plastic deformation during transfer of the ship from the building ways to the launching ways. It is recommended that discontinuous sliding ways should be used in launching ships since the stresses in bottom plates are not increased significantly over the case where unbroken ways are used while the savings in materials and labor may be considerable. Orig. art. has: 4 figures, 1 table, 17 formulas.

SUB CODE: 13/ SUBM DATE: None/ ORIG REF: 002

Card 2/2

KOCHANOVA, L. A.

USSR/Metallurgy - Aluminum, Mechanical Properties 1 Sep 53

"On the Effect of Oxide Films on Deformation of Aluminum in Active and Inactive Media," (1) L. A. Kochanova, (2) B. Ya. Yampol'skiy, (3) Moscow State U

DAN SSSR, Vol 92, No 1, pp 119-122

Studies effect of oxide films of various thicknesses on plastic deformation of metals, experimenting with wire made of 99.85% pure Al, coated by sulfuric acid anodizing process, and subjected to tension in water and aqueous solns of surface-active substance, such

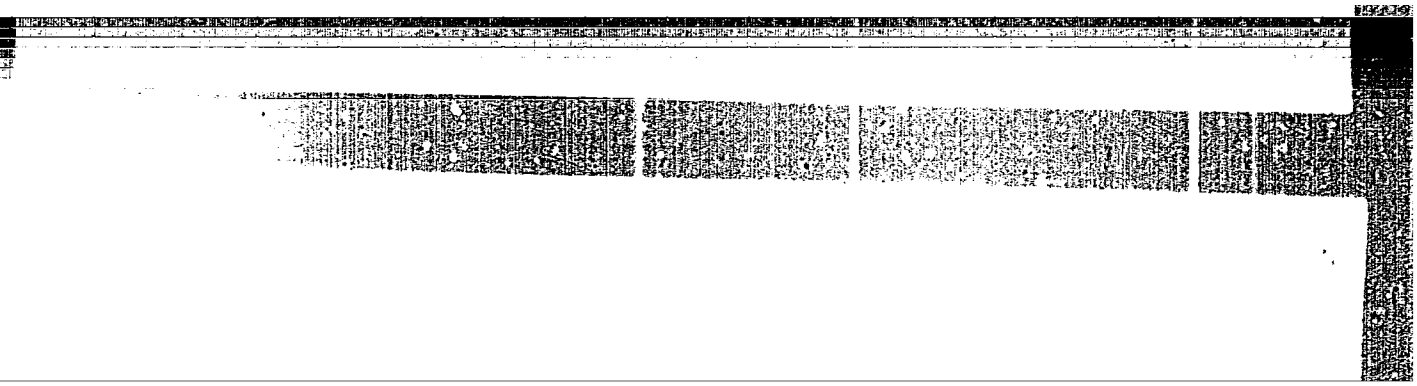
274T55

as Na dioctylsulfosuccinate. Results are presented in form of diagrams. Presented by Acad P. A. Rebinder 29 June 53.

KOCHANOVA, L. A.

Dissertation: "An Investigation of the Influence of Surface-Active Agents on the Plastic Flow of Polycrystalline Aluminum at Various Degrees of Surface Oxidation." Cand Chem Sci, Moscow Order of Lenin State U imeni M. V. Lomonosov, 18 Jun 54. (Vechernyaya Moskva, Moscow, 9 Jun 54)

SO: SUM 318, 23 Dec 1954



APPROVED FOR RELEASE: 09/18/2001 CIA-RDP86-00513R000723420015-7"

SOV/20-120-4-19/67

AUTHORS: Likhtman, V. I., Kochanova, L. A., Bryukhanova, L. S.

TITLE: The Brittle Destruction of Single Zinc Crystals (O khrupkom razrushenii monokristallov tsinka)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 4, pp.757-760 (USSR)

ABSTRACT: The single-crystal samples were produced from pure zinc (99,99 %) by the method of zone-crystallization which had been developed in the authors' laboratory. The rules governing the brittle destruction of single zinc crystals with different initial orientations of the basic plane with respect to the axis of the wire ($15^\circ < \chi_0 < 80^\circ$) were investigated by means of uniaxial rotation with constant velocity of the extension ($\sim$12 % min^{-1}) of the samples in inactive and surface-active media. A diagram shows the results of the experiments carried out with single zinc crystals at the temperature of liquid nitrogen. The plastic displacement preceding the destruction is all the greater the smaller χ_0. Besides, the normal tensions necessary for the break in the

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The Brittle Destruction of Single Zinc Crystals

basal plane decrease considerably with increasing χ_o. The brittle breaking off on the basal plane is facilitated by a previous displacement in this plane. At relatively high normal tensions in the basal plane a slight displacement will already be sufficient to cause elastic breaking off. The experimental data obtained gave the following results:
The so-called Zonke Law of the constancy of vertical normal tensions does not apply to single zinc crystals in a brittle state. Plastic displacement causes defects in crystal structure which prove to be the original cause of destruction. No "consolidation when breaking off" was observed in the case of single zinc crystals. The rules governing the brittle destruction in single zinc crystals at low temperatures apply also if transition to the brittle state occurs under the influence of a strong surface-active medium (e.g. mercury). A brittle state of a single zinc crystal that is caused by mercury satisfies the same general regular rules as the viscosity due to low temperatures. There are 4 figures, 1 table, and 15 references, 8 of which are Soviet.

The Brittle Destruction of Single Zinc Crystals SOV/20-120-4-19/67

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR
(Institute of Physical Chemistry AS USSR)

PRESENTED: January 31, 1958, by P.A. Rebinder, Academician

SUBMITTED: January 22, 1958

1. Single crystals—Mechanical properties 2. Single crystals—Test-methods 3. Zinc—Crystallization 4. Zinc—Fracture

Card 3/3

KOCHANOVA, L.A.; LIKHTMAN, V.I.; REBINDER, P.A.

Effect of fusible metal melts on the mechanical properties of single crystals of higher melting metals. Biul. Inst. metaloker. i spets. splav. AN URSR. no. 4:72-78 '59.
(MIRA 13:11)

(Metal crystals--Thermal properties)

24.7500 18.8200 67397

~~10(7)~~ SOV/181-1-9-21/31

AUTHORS: Bryukhanova, L. S., Kochanova, L. A., Likhtman, V. I.

TITLE: The Rules Governing the Brittle Destruction of Single Zinc Crystals

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 9, pp 1448 - 1456 (USSR)

ABSTRACT: The present paper offers a contribution to the problems related to modern technical requirements concerning the investigation of the relationship existing between the mechanical properties of metals and the chemicophysical influence exerted by the medium surrounding them during deformation. First, a number of pertinent papers is partly dealt with in detail, among others, publications by Academician P. A. Rebinder et al., Kishkin, Nikolenko, Ratner, Potaka, Shcheglakova, Roshanskiy, Pertsov, and Shchukin. The authors of the present paper investigated the rules governing the brittle destruction of a single zinc crystal wire at different orientations of the base plane to the wire axis ($13^0 \leq \chi_0 \leq 80^0$) at liquid nitrogen temperature (-196°C) at elongation at a constant rate (~12%/min). The single crystals

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The Rules Governing the Brittle Destruction of Single Zinc Crystals

were pure to a degree of 99.99%, and were prepared in the authors' laboratory by zonal crystallization. The critical shearing stress in the base plane attained ~ 130 g/mm^2 at these temperatures and was independent of the orientation of this plane to the crystal axis, as shown by special experiments. Mercury was used as surface-active material. Figure 1 shows the measuring values and the calculated dependence of the limit of the plastic dislocation (a_m) of the single zinc crystals on the orientation angle of the base plane (χ_0). The steep decline of a_m is described by formula $a_m = \frac{(\varepsilon+1)\sin(\chi_0-\chi_1)}{\sin^2\chi_0}$, where ε is the limit of elongation before tearing, χ_1 is the final orientation of the base plane before tearing. Figure 2 shows the dependence of the normal tension N, acting upon the base plane, on the displacement a during deformation at different χ_0 values. The following holds; $N = P \sin\chi_0 \sin\chi_1$;

P is the indication of the dynamometer, proportional to the degree of elongation. Table 1 contains the values of a_m, N_m, and S_m (shearing stress) for 6 χ_o values in the moment of brittle tearing. Figure 3 shows the dependence of the yield limit P_o and the critical normal tension N_o at the yield limit of χ_o at constant S_o, and figure 4 the dependence of a_m, N_m, and S_m on χ_o. $P_o(\chi_o)$ shows a symmetrical course, first a drop with growing χ_o, a minimum at $\sim 45^\circ$ and another rise; $S_o(\chi_o)$ rises exponentially with growing χ_o; $a_m(\chi_o)$ drops exponentially, $N_m(\chi_o)$ rises and $S_m(\chi_o)$ shows a linear drop with growing χ_o. Figure 5 shows the drop of N_m with rising pre-deformation (ε_{pre}) at 20°C. (The samples were first elongated at room temperature, only thereafter cooled, and further elongated to the tearing point). All these experiments were also carried out under other conditions: the transition into the brittle state was not attained by cooling, but by the action of a strongly surface-active agent (Hg). Table 2

The Rules Governing the Brittle Destruction of Single Zinc Crystals

shows the measured a_m-, N_m-, and S_m values for this case, and figure 6 the function $P(\varepsilon)$ for nonamalgamated (full circles) and amalgamated (empty circles) single zinc crystals at $\chi_o = 48^\circ$ and $T = 20^\circ C$ (the values coincide within the measuring accuracy). Figure 7 shows $a_m(\chi_o)$ for amalgamated and nonamalgamated samples at $20^\circ C$; in the first case a_m decreases with χ_o, in the latter case it rises strongly. Figure 8 shows $a_m(\chi_o)$, $N_m(\chi_o)$, and $S_m(\chi_o)$ for amalgamated single crystals only, figure 9 $P(\varepsilon)$ for both types at $\chi_o = 48^\circ$ and $T = -196^\circ C$, figure 10 $N_m(\varepsilon_{pre})$ for amalgamated samples at 20° and nonamalgamated at $185^\circ C$. Shchukin (Ref 15) is mentioned in the text. There are 10 figures, 2 tables, and 17 references, 9 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR Moskva (Institute of Physical Chemistry of the AS USSR, Moscow)

SUBMITTED: February 20, 1958

05276

18(4), 24(2) SOV/170-59-7-7/20

AUTHORS: Kochanova, L.A., Andreyeva, I.A., Shchukin, Ye.D., Likhtman, V.I.

TITLE: Regularities in the Brittle Fracture of Pure and Alloyed Single Crystals of Zinc

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1959, Nr 7, pp 45 - 52 (USSR)

ABSTRACT: The authors studied regularities in the fracture of pure and alloyed single crystals of zinc along the cleavage plane (0001). Pure crystals were taken of 3 kinds: containing 99.999% of elemental zinc, containing 99.99% of it and commercial zinc; those of alloyed specimens contained 0.2 and 0.5% of cadmium. Experiments were carried out in two versions: in the absence of an active absorption medium at a temperature of -196°C and with a thin mercury film of about 5 μ thick applied to the specimen, at room temperature. Crystals were produced by the zonal crystallization method and were 0.54 to 0.9 mm in diameter and about 10 mm long. The fracture of crystals was performed on the Polyany device at a constant stretching rate of 10 to 15% per minute. The authors formulated a "condition of the constancy of the product of normal by shearing stresses", which is expressed by Formula 1: $p_c \cdot \tau_c = \text{const} = K^2$. By analyzing a considerable amount of experimental data the authors have established that

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Regularities in the Brittle Fracture of Pure and Alloyed Single Crystals of Zinc

this condition is fulfilled within a wide range of orientations of single crystals for both pure and alloyed specimens. As the quantity of the admixture increases, the value of K also increases. The authors explain this by a hypothesis on the origination of heterogeneities in the shearing process and occurrence of plastic deformation during a phase immediately preceding fracture. The value of K for amalgamated specimens is twice as low compared to non-amalgamated ones, both for pure and alloyed crystals. This is explained by the lowering of the surface energy of zinc in the presence of mercury. The condition formulated by the authors agrees well also with the experimental data of the other investigators in this field, such as Deruyttere and Greenough [Ref 5], and is consistent with the theory of P.A. Rebinder [Refs 7-10] on the effect of adsorption-active media

05276
SOV/170-59-7-7/20

Regularities in the Brittle Fracture of Pure and Alloyed Single Crystals of Zinc

on deformation and strength properties of solid bodies.
There are: 4 graphs, 2 tables and 13 references, 12 of which are Soviet and 1 unidentified.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry of the AS USSR), Moscow.

Card 3/3

24,5300

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18 (6)

S/170/59/002/12/013/021
B014/B014

AUTHORS: Pertsov, N. V., Goryunov, Yu. V., Kochanova, L. A., Likhtman, V. I.

TITLE: The Influence Exerted by the Deformation Rate and Temperature Upon the Amount of the Adsorption Effect of Reduction in the Strength and Plasticity of Metals and Easily Fusible Metallic Melts

PERIODICAL: Inshenerno-fizicheskiy zhurnal, 1959, Vol 2, Nr 12, pp 17-22 (USSR)

ABSTRACT: In the experiments described amalgamated tin single crystals (purity of 99.999 %) about 1 mm thick were deformed at room temperature within a wide velocity range (from 10^2 to 10^6 % per minute). In order to study the effect of temperature, experiments were carried out in the temperature range ± 40° C and at - 196° C. The dependence of the elongation and actual breaking stress of amalgamated and non-amalgamated tin single crystals upon the logarithm of the reciprocal deformation rate is diagrammatically shown in figure 1. The diagram of figure 2 illustrates the elongation of pure and amalgamated tin crystals at 25° C and -196° C. Here the deformation rate was 1%/min. These and further experiments indicated that, if the rate of deformation is low, amalgamation does not affect the mechanical properties. It may be seen from figure 1

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The Influence Exerted by the Deformation Rate and Temperature Upon the Amount of the Adsorption Effect of Reduction in the Strength and Plasticity of Metals and Easily Fusible Metallic Melts

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S/170/59/002/12/013/021
B014/B014

that at room temperature the action of mercury manifests itself only at a rate of 10^{4}%/min. The dependence of the actual breaking stress, elongation, and yield point of amalgamated and non-amalgamated tin single crystals upon temperature at a deformation rate of 1%/min is graphically represented in figure 3. Below -39° C it is no more possible to observe an effect of mercury, which is explained by its solidification. It was further shown that the temperature dependence of the above-described effects has the same character as their dependence on the deformation rate. The part played by surface-active mercury in these effects is explained by the fact that it facilitates the further development of microcracks into macroscopic cracks. There are 3 figures and 13 references, 12 of which are Soviet.

ASSOCIATION: Institut fizicheskoy khimii AN SSSR, g. Moskva (Institute of Physical Chemistry of the AS USSR, City of Moscow)

Card 2/2

SOV/126-8-2-19/26

AUTHORS: Kochanova, L.A., Likhtman, V.I. and Rebinder, P.A.

TITLE: Influence of Low Melting-point Fused Metal on the Mechanical Properties of Monocrystals of Higher Melting-point Metals

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 288 - 293 (USSR)

ABSTRACT: Single crystals of zinc (99.99%) and cadmium (99.99%) were used in fused tin and lead. Samples were deformed at 10-15% per minute with a temperature constant to ± 5 °C. The metallic medium (Sn or Pb) was deposited on the sample electrolytically (thickness 5 μ), which was then placed in a tube with powdered graphite to prevent oxidation. Figure 1 shows true stress-strain diagrams for pure zinc and zinc with a coating of tin. At room temperature the influence of tin is small but at higher temperatures tin causes a decrease in strength and plasticity. The relation between temperature and magnitude of the effect of tin is shown in Figure 2. The sharp increase in effect at 300 - 400 °C is connected with an increase in solubility of zinc in tin. The

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Influence of Low Melting-point Fused Metal on the Mechanical Properties of Monocrystals of Higher Melting-point Metals

character of the fracture also changes from plastic in air to brittle in tin. Lead-tin mixtures were also used. The effect of pure lead is very slight but with increase of tin content in the lead up to 20%, there is a sharp decrease in strength and plasticity of zinc (Figure 3). With further increase of tin content, the effect is much slighter. It was shown that if zinc coated with tin is held in lead at 400 °C for long priods, the strength of the zinc recovers (Figure 4). This shows the absence of any marked diffusion of tin in zinc. A decrease in plasticity and strength of cadmium in tin was also found (Figures 5,6). The results on single crystals show that the decrease in strength is not connected with any grain-boundary effect.

There are 6 figures and 21 references, of which 12 are English and 9 Soviet.

SOV/126-8-2-19/26

Influence of Low Melting-point Fused Metal on the Mechanical Properties of Monocrystals of Higher Melting-point Metals

ASSOCIATION: Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry of the Ac.Sc., USSR)

SUBMITTED: October 15, 1957

Card 3/3

5(4)

AUTHORS: Kochanova, L. A., Andreyeva, I. A., Shchukin, Ye. D.

SOV/20-126-6-44/67

TITLE: On the Brittle Rupture of Pure and Alloyed Zinc Single Crystals (O khrupkom razryve chistykh i legirovannykh monokristallov tsinka)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 6, pp 1304-1307 (USSR)

ABSTRACT: In the papers (Refs 1-4) the authors investigated the rupture of pure zinc single crystals along the cleavage face (0001) and found that the product of normal and cleavage tensions is constant - $p_0\tau_0$ = const = K^2. The results are given for technical zinc and for zinc alloyed up to 0.5 % with Cd and compared with the results obtained for pure zinc (Table 1). Figure 1 shows the values of rupture tension for pure zinc at -196° C and various angles between crystal axis and face (0001) as well as the effect of a mercury film upon the strength at +20° C. Table 1 shows that K increases with increasing amount of additions. Figure 2 shows the values of rupture tension τ for amalgamated and non amalgamated pure

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zinc single crystal in dependence on the crystallographic shear a. The characteristic break of the deformation curve at a_0 (flow limit) as well as the increase in strength for $a < a_0$ connected with the latter are due to the increase of the incomplete shears (dislocation accumulation). a_0 decreases with increasing amount of alloy components. Table 1 gives the degree of inhomogeneity $f = a_0/a_0'$ (a_0' refers to pure zinc). As shown by figures 3 and 4, the experimental results are in good agreement with those obtained by A. Deruyttière and G. B. Greenough (Ref 5). $p_0 r_0 = K^2$ holds for both amalgamated and not amalgamated zinc single crystals of varying purity. The values for K are reduced by 50 % as a result of the reduction of the free surface activity σ. The authors thank V. I. Likhtman for his advice. There are 4 figures, 1 table, and 13 references, 12 of which are Soviet.

On the Brittle Rupture of Pure and Alloyed Zinc Single Crystals SOV/20-126-6-44/67

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: February 17, 1959, by P. A. Rebinder, Academician

SUBMITTED: February 10, 1959

Card 3/3

18.9500 1521

32803
S/137/61/000/012/124/149
A006/A101

AUTHORS: Rebinder, P.A., Likhtman, V.I., Shchukin, Ye.D., Kochanova, L.A., Pertsov, N.V., Goryunov, Yu.V.

TITLE: Regularities and the mechanism of the effect of small surface active admixtures on deformation and strength properties of single crystal metals

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 12, 1961, 34-35, abstract 122h254 ("Tr. In-ta fiz. metallov, AN SSSR", 1960, no. 23, 147-161)

TEXT: Experiments were made with differently oriented Zn and Cd single crystals of 1 mm in diameter, coated with a thin film of surface active Sn and Hg metals. It is shown that at temperatures over T_e of "base metal-coating" eutectics, the presence of a molten surface-active metal layer strongly reduces deformability and strength of the specimen and promotes brittle failure. The brittle effect of the surface active metal is mainly a function of temperature and the deformation rate. Embrittlement and reduced strength are not connected with corrosion processes but are caused by a decrease of the work which is necessary for the development of crack nuclei, due to the adsorption of surface-

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A006/A101

active metal atoms on the internal micro-surfaces. At a drop of the test temperature below T_s of the "base metal-coating" eutectics, the embrittling effect vanishes gradually, due to a reduced mobility of adsorption-active atoms. The embrittling effect vanishes also at sufficiently high temperatures and low tension rates, when the resorption of deformation micro-heterogeneities and local stresses prevents the failure nuclei to develop into dangerous cracks, even at a considerable decrease of free surface energy. There are 21 references.

V. Stepanov

[Abstracter's note: Complete translation]

S/020/60/133/01/19/070
B014/B011

AUTHORS: Kochanova, L. A., Shchukin, Ye. D., Likhtman, V. I., Rebinder, P. A., Academician

TITLE: Origin and Development of Cracks in Deformed Crystals

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 1, pp. 71-73

TEXT: By way of introduction, the authors subdivide the cracking of a crystal on stretching into two stages depending on the course of deformation. In the stage A there occurs a slow formation and a gradual growth of the cracks at sites with high tension; in the stage B the crack quickly extends over the entire cross section of the crystal. The authors discuss the basic role of shear in stage A, and explain the origin of microcracks in this stage by the unification of dislocations and the formation of hollow nuclei. The mechanism of the development of cracks is closely examined, and V. N. Roshanskiy (Ref. 7) is mentioned in a discussion of the position of the cracks in the lattice. The most probable arrangement is regarded to be the serial arrangement of dislocations in a lattice plane, which develop to

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Origin and Development of Cracks in Deformed Crystals

S/020/60/133/01/19/070
B014/B011

a crack on further deformation. Formula (1) is given for the length c of a crack, and formula (2) for the normal tension. From these formulas the authors derive the condition for the constancy of the product from normal tension and shear stress; this constancy is well proven by experiments. The authors tested the independence of expression (1) of expression (2). For this purpose they studied the development of cracks in amalgamated zinc single crystals. Microscopic analyses revealed inner cracks in the crystal plane (0001) of all samples. Relation (1) and (2) by Griffith were tested experimentally, and a few relative results are given. The authors state finally that the results obtained by them prove the universal character of the scheme worked out by them for the analysis of a crack development. There are 3 figures and 14 references: 10 Soviet, 3 British, and 1 Japanese.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

SUBMITTED: April 7, 1960

Card 2/2

83131
S/020/60/133/005/008/019
B019/B054

18.8200

AUTHORS: Shchukin, Ye. D., Kochanova, L. A., Likhtman, V. I.

TITLE: Some Special Features of Brittle Destruction of Metallic Crystals

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 5, pp. 1064 - 1066

TEXT: In the introduction, the authors refer to some of their own previous papers (Refs. 1 and 2). There, it had been clearly established that in the rupture of amalgamated single zinc crystals a spread of rupture stresses occurs along the basic plane (0001). If, for a given angle χ_0 between the plane (0001) and the sample axis, $P_{min}(\chi_0)$ and $P_{max}(\chi_0)$ are the minimum and maximum rupture stresses for the angle χ_0, then the relative quantity $(P_{max} - P_{min})/P_{max}$ strongly increases with increasing χ_0. For $\chi_0 > 50^\circ$, this quantity remains below 10%, for $\chi_0 < 30^\circ$, it attains a value of more than 25%. To clarify these relations, the

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Some Special Features of Brittle Destruction of Metallic Crystals

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B019/B054

authors carried out microscopic investigations of the basic planes (0001) of the fragments obtained in the rupture of many amalgamated single zinc crystals. The diameter of the single crystals L_o was about 1 mm, χ_o was between 20 and 70°. Many steps were found (Fig. 1) in the surfaces of fracture which were caused by cracks on the transition from one (0001) plane into the other. Thorough investigations showed that the main steps appear in the places of origin of rupture cracks. In previous papers (Refs. 3 and 4), the authors gave a detailed theory of the origin of cracks, and here they quote formula (1) obtained here:

$$(p_c\tau_c)_A^{1/2}/(p_c\tau_c)_B^{1/2} \equiv (P_c\sin^{3/2}\chi\cos^{1/2}\chi)_A/(P_c\sin^{3/2}\chi\cos^{1/2}\chi)_B = \sin^{1/2}\chi_o.$$

Here, p_c is the normal stress to the basic plane, τ_c is the shearing stress, the indices A and B refer to the type of fragment, and P_c is the break stress. Fig. 2 shows the experimental data, corresponding to (1), for six differently oriented samples. It appears that (1) is fulfilled in a wide range of orientation with an error of about 10%. From the results obtained, the authors infer the difference between the roles played by the

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Some Special Features of Brittle Destruction of Metallic Crystals

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B019/B054

outer and helical dislocations in the mechanism of destruction. By a further investigation of normal and shearing stresses in the rupture of a crystal it should be possible to solve a number of problems which are connected with the temperature- and velocity dependence of destruction. There are 2 figures and 11 references: 8 Soviet, 2 German, and 1 US.

ASSOCIATION: Institut fizicheskoy khimii Akademii nauk SSSR (Institute of Physical Chemistry of the Academy of Sciences, USSR)

PRESENTED: April 7, 1960, by P. A. Rebinder, Academician

SUBMITTED: March 29, 1960

Card 3/3

24.7500 1418, 1136, 1143, 2807

S/181/61/003/003/023/030
B102/B205

AUTHORS: Kochanova, L. A., Shchukin, Ye. D., and Likhtman, V. I.

TITLE: Mechanism of coarse destruction of metallic crystals

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 902-910

TEXT: Studies conducted by the authors in their laboratory have shown that the mechanical properties of metals can be strongly influenced by placing them in highly adsorbing media (fusion of fusible metals). Such a treatment results in a considerable decrease in plasticity and strength. In the papers of Academician P. A. Rebinder et al. on the effect produced by adsorption from the ambient medium upon the mechanical properties of solids, these effects have been ascribed to the considerable decrease in free surface energy on the boundary between the deformed metal and its saturated solution in the other liquid metal. This effect of the metal melt occurs immediately. Experiments have shown that the rule governing the deformation and coarse destruction of metals is not altered by the presence of the liquid metal. The study of the mechanism of coarse destruction of metals is, however, considerably facilitated by the use of active metal melts. The present

Mechanism of ...

paper includes a detailed discussion of experimental data relating to this subject. The data were obtained at room temperature for amalgamated single crystals of zinc. Theoretical investigations have shown that the destruction (rupture on elongation) of single crystals of metals can be divided into two stages: Stage A: More or less slow formation and extension of "embryonic" cracks at points of elevated concentration of stresses, caused by inhomogeneities of plastic deformation. In this stage, the shear stress τ plays the most significant role. The growth of the cracks is accompanied by the occurrence of new dislocations. Stage B: Rapid extension of an unbalanced crack over the entire cross section of the crystal. This process is predominated by the normal stress p. The critical relation between normal stress and shear stress is given by $p_c \tau_c = \gamma^2 G\sigma/L$, where γ is a dimensionless coefficient which differs only slightly from 1; G is the shear modulus, L the cross section of the single crystal, and σ the specific free surface energy. Furthermore, the relations

$$c_{max} \sim \frac{\tau^2 L^2}{2E\sigma} = \frac{\beta \tau^2 L^2}{G\sigma} \quad (1) \text{ and } p_c = \alpha (E\sigma/c_{max})^{1/2} = \alpha' (G\sigma/c_{max})^{1/2} \quad (2) \text{ hold;}$$

c is the length of the crack, E the elastic modulus, and β a dimensionless

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coefficient of the order of unity. The two last-mentioned relations which characterize A and B, respectively, were experimentally verified independently of each other. This was done by a study of the formation of cracks on an increase in p and τ. The specimens (amalgamated single crystals of zinc) had a purity of 99.99%, a diameter of 1 mm, a length of 10 mm, and showed different angles of inclination of the basal planes toward the axis of the specimens. The rate of elongation was constant and amounted to 12%/min. The stresses were determined from the relations

$\tau_c = P_0 \sin\chi_0 \cos\chi$, $p_c = P_0 \sin\chi_0 \sin\chi$, where P_0 is the tensile stress referred to the initial cross section, and χ is the angle of inclination of the basal plane toward the axis of the specimen for a given deformation ε. The validity of the function $\sigma_{max}(\tau)$ was proved by a series of specimens with $\chi_0 = 21^\circ$, and specimens with χ_0 varying from 16 to 67° showed the correctness of the relation (2) by Griffith. A study of cracks of destroyed specimens has shown that the predominant role in the formation of destructive cracks is presumably played by angular or screw dislocations.

V. N. Rozhanskiy is mentioned. There are 5 figures and 31 references: 21 Soviet-bloc and 10 non-Soviet-bloc.

Card 3/4

20797

Mechanism of ... S/181/61/003/003/023/030
B102/B205

ASSOCIATION: Otdel dispersnykh sistem Instituta fizicheskoy khimii AN SSSR Moskva (Department of Disperse Systems of the Institute of Physical Chemistry of the AS USSR, Moscow)

SUBMITTED: July 28, 1960

Card 4/4

S/070/63/008/001/011/024
E132/E460

AUTHORS: Shchukin, Ye.D., Kochanova, L.A., Pertsov, A.V.

TITLE: The temperature at which the transition from brittleness to plasticity occurs when the strength is lowered by absorption effects

PERIODICAL: Kristallografiya, v.8, no.1, 1963, 69-74

TEXT: It was shown earlier that single crystals of Zn, coated with a thin layer of Hg, show a brittle fracture at room temperature for very low strains because of the reduction in strength by the absorption effect. Without Hg, brittle fracture occurs only at low temperatures. The brittleness is related to the stability of a crack. Here, rods of Zn of varying purity, with and without amalgamation, have been pulled at a constant rate of deformation (10%/min) at temperatures from -200 to +200°C. The plasticity (limiting crystallographic slip) and strength $K = (p_c t_c)^{1/2}$ where p_c is the critical normal strain and t_c the critical shear strain, are plotted against temperature. It seems that the differences are connected with the greater strength of the pinning of dislocations in amalgamated

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The temperature at which ...

crystals as a result of the absorption on to the dislocations of atoms of Hg. However, the matter is not simple and it may be that Hg only fixes dislocations near growing cracks into which Hg atoms penetrate from the surface, the effects in the bulk of the material being small. Similar phenomena have been observed with Zn crystals coated with Ga but an accompanying development of plasticity did not take place. There are 4 figures.

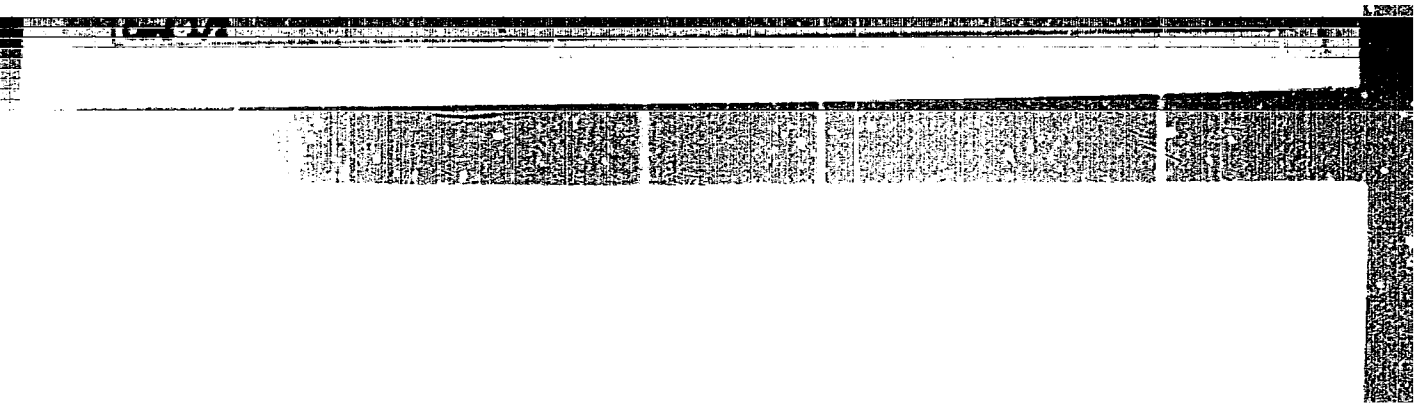
ASSOCIATION: Institut fizicheskoy khimii AN SSSR
(Institute of Physical Chemistry AS USSR)

SUBMITTED: February 14, 1962

SHCHUKIN, Ye.D.; KOCHANOVA, L.A.; PERTSOV, A.V.

Temperature-dependent transition from brittleness to plasticity under conditions of the adsorption effect of reduced strength. Kristallografiia 8 no.1:69-74 Ja-F'63 (MIRA 17:7)

1. Institut fizicheskoy khimii AN SSSR.



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EWT(m)/EPF(c)-2/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) LJP(c) JD/WW/WW/JG

ACC NR: AP5027140 SOURCE CODE: UR/0126/65/020/004/0555/0560

AUTHOR: Kochanova, L. A.; Zanozina, Z. M.; Shchukin, Ye. D.; Likhtman, V. I.; Rebinder, P. A. 44,55 44,55 44,55 44,55 60

ORG: Institute of Physical Chemistry AN SSSR (Institut fizicheskoy khimii AN SSSR) 44,55

TITLE: Use of emulsification for refining the structure of alloys with a limited solubility of components in the liquid state 44,55 19

SOURCE: Fizika metallov i metallovedeniye, v. 20, no. 4, 1965, 555-560

TOPIC TAGS: alloy, alloy structure, structure refining, alloy emulsification

ABSTRACT: An attempt has been made to refine the structure of alloys whose components have a limited solubility in the liquid state by emulsification, i.e., vibration applied at temperatures above the liquidus curve. The experiments were carried out with Zn-Pb-Sn alloys melted from components of no less than 99.99% purity. The crucible containing 40 g of molten alloy metal was heated to a temperature 50—100C higher than that of "layering" and subjected to intensive vibration, then cooled to a temperature below that of layering, held for 30 min, again subjected to vibration, and water cooled. It was found that this treatment produced a fine-grained alloy structure, especially when final vibration was applied at 400—600C. This opens the possibility of using colloid chemistry in the field of metal science to control the structure of alloys. The experiments should be expanded to higher melting alloys.

Card 1/2 UDC: 548.5

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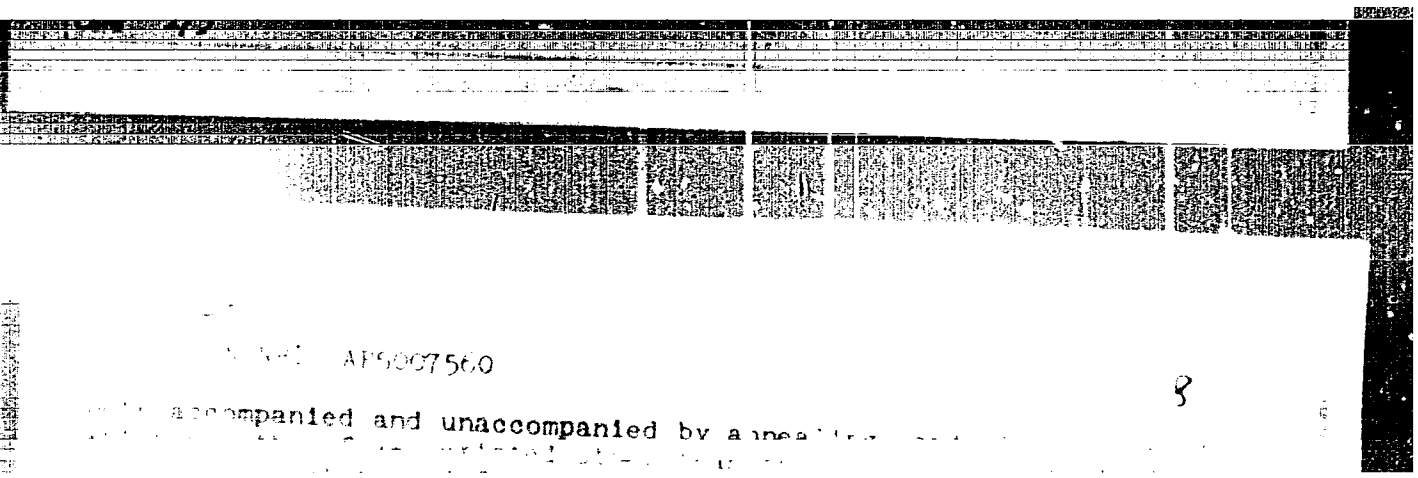
ACC NR: AP5027140

such as Cu-Co, Cu-Mo, Cu-Cr, using nickel and iron as the third component in order to lower the interphase tension. Orig. art. has: 4 figures. [AZ]

SUB CODE: 11/ SUBM DATE: 20Oct64/ ORIG REF: 003/ OTH REF: 002/ ATD PRESS: 4168

Card 2/2



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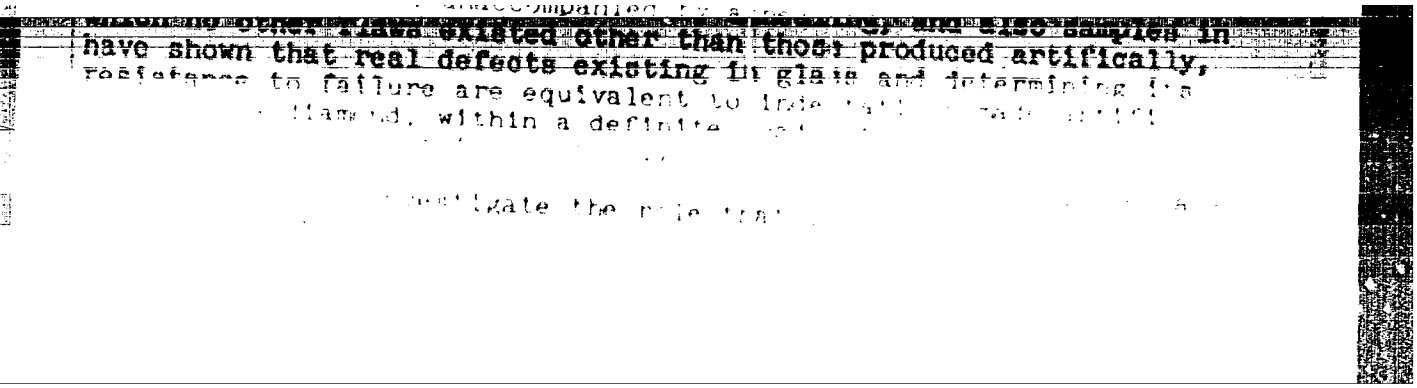
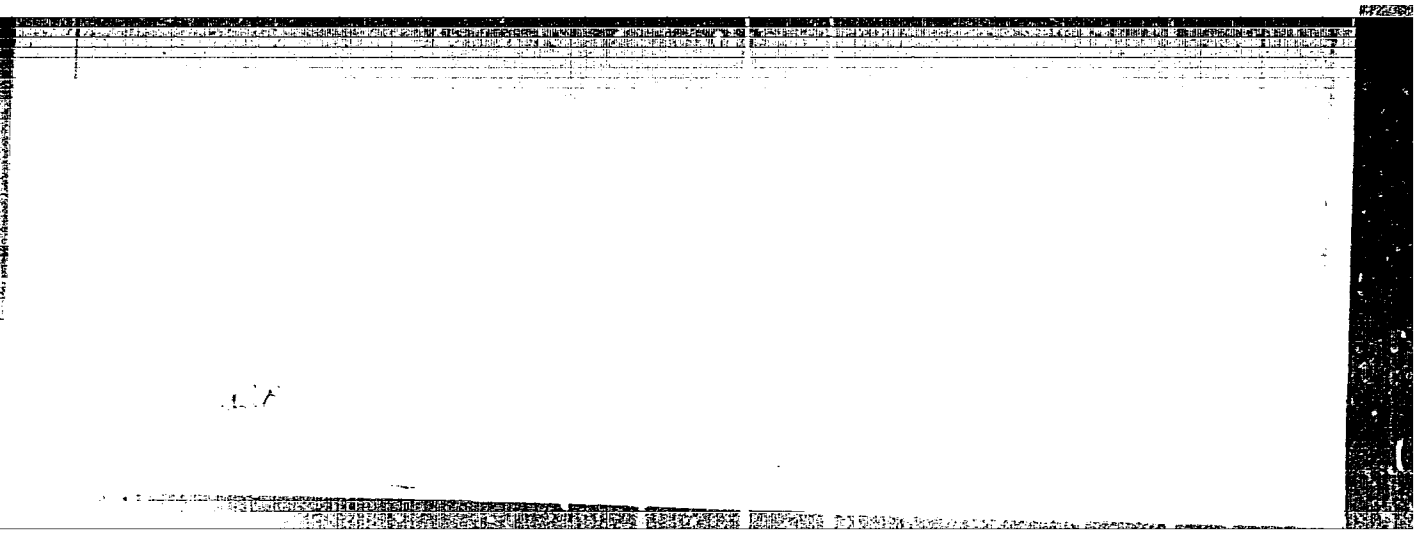
accompanied and unaccompanied by a



have shown that real defects existing in glass and determining its
resistance to failure are equivalent to [illegible]
flaws, within a definite [illegible]

[illegible]vestigate the [illegible]



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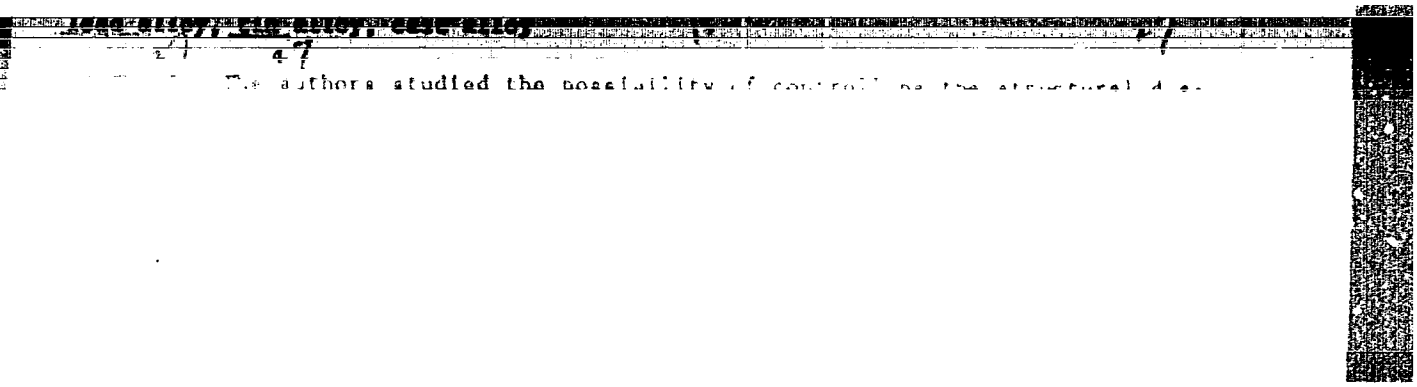
L 62014-65 EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD

ACCESSION NR: AP5007664 S/0020/65/160/006/1355/1357

[illegible] Zanozina, T. M., Kochanova, L. A., Lichtman, V. I.,

[illegible] possibility of preparing alloys with a highly dispersed structure by



The authors studied the possibility of control on the structural d e-

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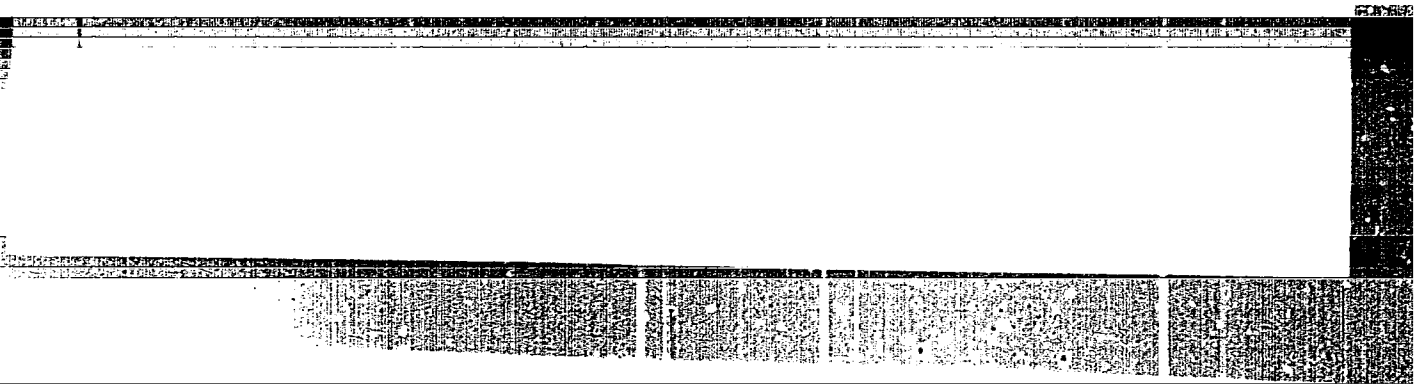

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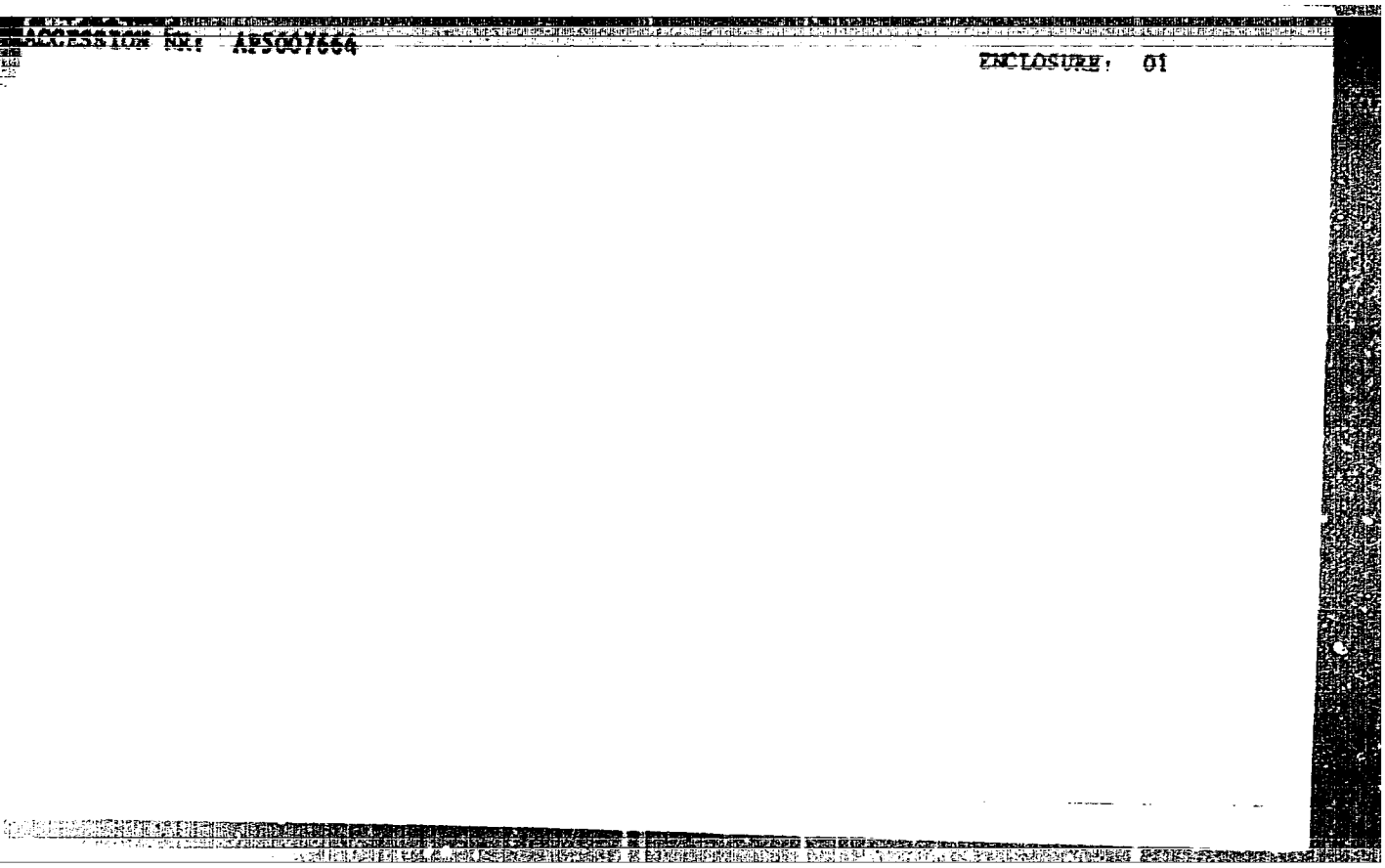

S/191/60/000/005/019/020
B004/B064

AUTHORS: Tsipes, L. Ya., Sokolov, A. D., Kochanova, M. K., Lyakina, Z. N.

TITLE: Molding of Products From Novolak Molding Material

PERIODICAL: Plasticheskiye massy, 1960, No. 5, pp. 67-69

TEXT: It is the aim of the present paper to raise the efficiency of presses by increasing the molding temperature for the production of materials from novolak molding powders of the K-15-2 (K-15-2), K-17-2 (K-17-2), K-20-2 (K-20-2), K-119-2 (K-119-2), and K-118-2 (K-118-2) types. The laboratory of the zavod "Karbolit" ("Karbolit" Plant) developed in 1938-1939 a procedure to render molding possible at 175 - 185°C with the molding material being preheated. Experiments with material preheated in a high-frequency field to 100 - 110°C showed that the product No. 3388/1 (safety cartridge), 46 mm high, wall thickness 6 mm, can be molded at 205 - 215°C, and the product No. 3388/2 (incandescent lamp socket) 28 mm high, wall thickness 4 mm, can be molded at 215 - 230°C. Thus, the time of molding was reduced without any change in strength, heat resistance, and water adsorption. M. G. Gurariy is mentioned. There are 5 tables and 6 references: 5 Soviet and 1 British.

Card 1/1

GENKEL', P.A., prof., otv. red.; MATSYUK, L.S., kand. sel'khoz. nauk, sam. red.; DIMO, N.A., red. [deceased]; DIKUSAR, I.G., doktor sel'khoz. nauk, red.; YAROSHENKO, M.F., doktor biol. nauk, red.; KOVARSKIY, A.Ye., doktor sel'khoz. nauk, red.; ZUBKOV, A.A., doktor med. nauk, red.; PRINTS, Ya.I., doktor biol. nauk, red.; GEYDEMAN, T.S., kand. biol. nauk, red.; IVANOV, S.M., kand. biol. nauk, red.; USPENSKIY, G.A., kand. biol. nauk, red.; GERGELEZHIU, A.K., kand. tekhn. nauk, red.; FITOVA, L., red.; KARYAKINA, I., red.; KOCHANOVA, N., red.; TEL'FIS, V., tekhn. red.

[Papers of the United Scientific Session of the Department of Biological Sciences of the Academy of Sciences of the U.S.S.R., the Department of Agriculture of the V.I.Lenin All-Union Academy of Agricultural Sciences and the Moldavian Section of the Academy of Sciences of the U.S.S.R.] Trudy ob"edinennoi nauchnoi sessii: Otdelenie biologicheskikh nauk AN SSSR, Otdelenie zemledeliia VASKhNIL, Moldavskii filial AN SSSR. Kishinev, Kartia Moldovenieske. Vol.2. 1959. 483 p. (MIRA 15:5)

1. Ob"edinennaya nauchnaya sessiya, Kishenev, 1957. Zamestitel' akademika-sekretarya Otdeleniya biologicheskikh nauk Akademii nauk SSSR (for Genkel'). 2. Deystvitel'nyy chlen Vsesoyuznoy akademii sel'skokhozyaystvennykh nauk im. V.I.Lenina (for Dimo).
(Moldavia--Agricultural research--Congresses)

OZEROVA, M.I.; KOCHANOVA, N.N.; IVANOVA, I.N.

Equilibrium in systems consisting of isomorphic schoenite-type components, and a thermographic study of double salts and their isomorphic mixtures. Vest. Mosk un Ser. 2: Khim. 15 no.4:33-35 Jl-Ag '60. (MIRA 13:9)

1. Kafedra obshchey khimii Moskovskogo universiteta.
(Systems (Chemistry)) (Salts)

S/153/60/003/004/010/040/XX
B023/B054

AUTHORS: Chirkov, S. K., Braynina, Kh. Z., Kochanova, O. M.

TITLE: Use of Polyvinyl Alcohol in Polarography

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Khimiya i khimicheskaya tekhnologiya, 1960, Vol. 3, No. 4, pp. 600 - 603

TEXT: The authors studied the effect of polyvinyl alcohol on the reduction of Cu-, Cd-, and Zn ions on a dropping mercury electrode from a chloride ammonium solution. The investigation of the applicability of polyvinyl alcohol for this purpose was suggested by Professor A.A. Tager, who is thanked by the authors. The studies were conducted on a visual polarograph of the УФАН (UFAN) system. The amperage was measured with a reflecting galvanometer of the type М-21 (M-21). The potential of the mercury electrode was measured by the compensating method referred to a saturated calomel electrode. This calomel electrode, which was connected with the electrolyser by a low-resistance electrolytic bridge, served as anode. The mercury was previously distilled in vacuo. All solutions

Use of Polyvinyl Alcohol in Polarography S/153/60/003/004/010/040/XX
B023/B054

were prepared with doubly distilled water. The salts of the minerals studied (copper-, cadmium-, and zinc sulfates) were twice recrystallized from the doubly distilled water. After previous swelling in a small amount of water, the polyvinyl alcohol(molecular weight 25,000) was dissolved. The cations were polarographed on a chloride-ammonium background ($1.5N\ NH_4Cl$; $1.5N\ NH_4OH$) with an addition of 4.0 g of crystalline sodium sulfite on 100 ml of solution. The ammonia was distilled in a glass apparatus. Ammonium chloride and sodium sulfite were recrystallized from doubly distilled water. Figs. 1-3 show the results. The upper curve (Fig.1) has two maxima whose character has not yet been determined. Polyvinyl alcohol suppresses current maxima on all curves studied. A table shows that, in the presence of polyvinyl alcohol, the reduction of copper- and zinc ions on the mercury electrode proceeds irreversibly. The reduction of cadmium is not so much influenced by polyvinyl alcohol. There are 3 figures, 1 table, and 5 references: 2 Soviet and 2 US.

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Use of Polyvinyl Alcohol in Polarography S/153/60/003/004/010/040/XX
B023/B054

ASSOCIATION: Ural'skiy gosudarstvennyy universitet im. A. M. Gor'kogo
Kafedra analiticheskoy khimii (Ural State University
imeni A. M. Gor'kiy, Department of Analytical Chemistry)

SUBMITTED: November 21, 1958

Card 3/3

FEYN,Yu., ref.; KOCHANOVA,Ye.B., ref.; DRABKIN,O.S., ref.

From the pages of journals. TSement 21 no.4:29-32 Ag'55.
(Cement industries) (MLRA 8:11)

KOCHANOVA, Ye.B.; DRABKIN, O.S.

Cement industry in the United States; from the pages of foreign journals. Tsement 22 no.1:28-31 Ja-F '56.
(United States--Cement industries) (MLRA 9:6)

KOCHANOVA, Ye.B., inzhener.

Cement industries in France. TSement 22 no.2:32 Mr-Ap '56.
(France--Cement industries) (MLRA 9:9)

KOCHANOVA, Ye.B., inzhener.

Cement industry in Sweden. TSement 23 no.1:30-31 Ja-F '57.
(Sweden--Cement industries) (MLRA 10:4)

MUCHARKOVA, Ye.N., inzhener.

Effect of cooling conditions and mineralogical composition on clinker crushing (from "Zementindustrie Zeitung" no. 1/2, 1957). TSement 23 no.4:31 Jl-Ag '57. (MLRA 10.11)

(Cement)