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*Bezukhov, N.I.*

PHASE I BOOK EXPLOITATION

321

Panovko, Yakov Gilelevich

Osnovy prikladnoy teorii uprugikh kolebaniy (Principles of Applied Theory of Elastic Vibrations) Moscow, Mashgiz, 1957. 335 p. 5,000 copies printed.

Reviewer: Bezukhov, N. I., Dr. of Tech. Sciences, Prof.; Ed.: Afanas'yev, M. A., Candidate of Tech. Sciences, Docent; Ed. of Publishing House: Martens, S. B., Engineer; Tech. Eds.: Tikhanov, A. Ya. and Sokolova, T. F. Managing Ed. for general technical literature (Mashgiz): Ponomareva, K. A.

PURPOSE: This book is for engineers and technologists of scientific-research institutes and of design departments of factories.

COVERAGE: This book presents the general theory of elastic vibrations in the three main types of elastic systems: systems with one degree of freedom, systems with several degrees of freedom, and systems with continuous distribution of mass (with an infinite number of degrees of freedom). Problems of vibrations occurring in internal-combustion engines, steam and gas turbines, automobiles, in metalworking, and in other technological processes are considered. Some of these problems are connected with the latest technological developments which include

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Principles of Applied Theory of Elastic Vibrations

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new vibration problems: frictional autovibrations, vibrations in metalcutting, automatic balancing of rotors, etc. Computational methods are stated and compared, and as a result, some traditional concepts are declared obsolete, e.g., application of Fourier's series to the analysis of forces. The text is illustrated with numerous calculations. The book may serve as a guide to literature in the field and as an introduction to specialized literature concerned with complex problems in the theory of vibrations. Soviet contributions in the field of the theory of elastic vibrations are mentioned along with developments of new problems, derivation of particular and generalized solutions, etc. There are 178 figures, 7 tables, 802 equations, and 209 references of which 152 Soviet, 24 German, 15 English, 2 Czech, 1 Polish, and 1 Japanese.

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June 3, 1958

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SOV/124-58-11-13049

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 11, p 169 (USSR)

AUTHOR: Bezukhov, N. I.

TITLE: On a Dynamic Contact Problem (Ob odnoy dinamicheskoy kontaktnoy zadache)

PERIODICAL: Sb. tr. Vses. zaogn. inzh.-stroit. in-t, 1957, Vol 1, pp 63-71

ABSTRACT: The author first examines a problem on vibrations of a massive body freely supported by an elastic sphere which, in turn, is supported by an elastic half-space; without considering the unilateral nature of the contacts in the "body-sphere-half-space" system, the author derives approximate solutions for the following problems: The frequency of vertical vibrations of a massive body which has only one degree of freedom, and the amplitude of vibrations produced by impulses of an "instantaneous force", as the expression  $P\Delta t$  is designated by the author. The natural frequency was found to be a function of the amplitude of the vibrations. The solution obtained is expanded to include the case of vibration of the same massive body supported by a system of spheres arranged along a circular groove.

I. K.

Card 1/1

SOV/124-58-2-2113

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 2, p 87 (USSR)

AUTHORS: Bezukhov, N.I., Luzhin, O. V.

TITLE: On the Calculation of Thin-walled Beams With Respect to Forced Vibrations (K raschetu tonkostennykh sterzhney na vynuzhdennyye kolebaniya)

PERIODICAL: V sb.: Issledovaniya po teorii sooruzheniy. Nr 7, Moscow, Gosstroyizdat, 1957, pp 7-41

ABSTRACT: An investigation of forced vibrations of thin-walled beams. It is indicated that the influence of a constraint of nonplane deformations of the cross sections of thin-walled beams becomes greater with dynamic loadings than with static loads. An examination is made of the forced torsional vibrations of thin-walled beams with two axes of symmetry. The flexural vibrations of such beams are expressed by the same equations that are well known from the theory of the vibrations of nonthin-walled beams. The equations of torsional vibrations are then described by a single differential equation. In the solution of that equation the authors utilize the method of initial parameters for which in this paper the authors provide definitive

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On the Calculation of Thin-walled Beams With Respect to Forced Vibrations SOV/124-58-2 2113

formulas for any generic section and a table of the amplitudes of the vibrational reactions for several specific cases of the attachment of such beams. As an example the authors examine an H beam, at the center of the span of which a concentrated torque is applied. It is found that the constraint of the nonplane deformations reduces the second-order moment at midspan by more than one half, while the torque at the supports is reduced by 30 percent. For the purpose of comparison the paper also adduces distribution curves relative to the amplitudes obtained in the calculations of the same H beam conducted for it as a nonthin-walled beam. Thereupon the study continues with an examination of the free torsional vibrations of thin-walled beams having sections with two axes of symmetry. In that case the value of the external disturbance must be equalled to zero in the equations of the torsional vibration forces, while the frequency of the forced vibrations should be replaced by the natural frequency. For an H beam of the Nr 30a type the first natural frequency was found to be 2.5 times as great as when the same profile was considered as a nonthin-walled beam. At this point the authors adduce some experimental data, namely, the results of an experimental investigation of a Nr 18 H beam, one end of which was free, while the other end was tightly welded to a special plate. The difference between test data and theoretical values amounted to only 4-5 percent. Further on the authors discuss the forced

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SOV/124-58-2-2113

On the Calculation of Thin-walled Beams With Respect to Forced Vibrations

flexo-torsional vibrations of thin-walled beams having a section with but a single axis of symmetry. The corresponding formulas and amplitude tables for the initial parameters, in this case, were found to be more complicated. As a result of a comparison of the distribution curves of the force and kinematic factors for a thin-walled beam (viz., a Nr 16a channel beam) one may note that when the beam is acted upon by a concentrated force and a torque moment of equal magnitude the torsional factors are considerably smaller for a vibrating concentrated force than for a torque moment vibrating with the same frequency, and, conversely, the flexural factors in the second case are small as compared to those obtaining in the first case. Consideration is given to the influence of concentrated masses on the amplitudes of a forced vibration and to the case of the presence of a longitudinal force due to an elastic and an elastic-moment foundation. Lastly, the authors discuss the peculiarities of the dynamic calculation of composite beams made up of thin-walled elements, in particular of beams with a discontinuous axis. The paper introduces the concept of a "dynamic center of stiffness", which is characterized by the property that a dynamic transverse load passing through it does not exert any torque upon the beam.

D. V. Bychkov

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(Elastic rods and wires)

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[Engineering methods for strength and rigidity analysis; with  
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[Calculations for strength, stability, and vibrations at high  
temperatures] Raschety na prochnost', ustoichivost' i koleba-  
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BOOK EXPLOITATION

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Bezukhov, N. I.; Bazhanov, V. L.; Gol'denblat, I. I. (Doctor of  
Technical Sciences; Professor); Nikolayenko, N. A.; Sinyukov, A. M.

Calculations of strength, stability, and vibrations under high tem-  
perature conditions (Raschety na prochnost', ustoychivost' i  
kolebaniya v usloviyakh vysokikh temperatur) Moscow, Izd-vo  
"Mashinostroyeniye" 1965. 0566 p. illus., biblio. Errata slip  
inserted. 6000 copies printed.

TOPIC TAGS: structure strength, structure stability, structure  
vibration, thermal elasticity, thermal plasticity, creep thermal  
stress

PURPOSE AND COVERAGE: This book is intended for engineer-designers  
and scientific workers. It may also be used by students of schools  
of higher technical education as a supplementary text for studying  
the theory of thermal stresses. Methods of calculating the strength,  
stability, and vibration of structures used in machine-building  
which are exposed to large high-temperature gradients are described.

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Bezukhov, Nikolay Ivanovich

Examples and problems in the theory of elasticity<sup>4</sup>, plasticity, and creep (Primery i zadachi po teorii uprugosti, plastichnosti i polzuchesti) Moscow, Izd-vo "Vysshaya shkola", 1965. 319 p. illus., biblio. Textbook for students at higher technical schools. Errata slip inserted. 13,000 copies printed.

TOPIC TAGS: elasticity theory, plasticity theory, creep theory K

PURPOSE AND COVERAGE: <sup>26</sup> This book is a revised and supplemented edition of the author's previous book (Bezukhov, N. I. Sbornik zadach po teorii uprugosti i plastichnosti (Collected problems in the theory of elasticity and plasticity), Izd-vo "GITTL", 1957). A part of the problems given previously, especially those dealing with bars and frameworks are omitted here. Problems of vibrations of thin-walled beams and plates are completely omitted. The majority of the problems presented in the book are new. Additional examples are given beyond program requirements which can be used in seminars and by students who are completing their programs and have special

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L 3867-66  
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interest in problems in these fields. The purpose of the book is to give the students material to check their ability to apply their acquired theoretical knowledge to practical engineering problems and to help the teachers in arranging practical training of students.

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Ch. III. Approximate solutions in the theory of elasticity -- 132

Ch. IV. Nonlinear theory of elasticity and the theory of plasticity -- 161

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Ch. V. Approximate solutions in the theory of plasticity -- 261

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SUB CODE: ME, MA

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OTHER: 000

*mlr*  
Card 3/3

BEZUKHOV, N.I. (Moscow)

"The carrying capacity of elastic-plastic anisotropic plates under bending"

report presented at the 2nd All-Union Congress on Theoretical and Applied  
Mechanics, Moscow, 29 January - 5 February 1964

BEZUKHOV, V.N.

BEZUKHOV, V. N.- "On the settlement of a plastic layer of noncircular form in plan".  
Moscow, 1955. Moscow Order of Lenin and Order of Labor Red Banner State University  
M. V. Lomonosov. (Dissertation for degree of Candidate of Physicomathematical  
Sciences.)

SO: Knizhnaya Letopis'. No. 46, 12 November 1955. Moscow

BEZUKHOV, Y. N.

Law of minimum perimeters under conditions of free settling of plastic layers. Nauch.dokl.vys.shkoly; stroi. no.1:13-17 '59.  
(MIRA 12:10)

1. Rekomendovana kafedroy teoreticheskoy mekhaniki Vsesoyuznogo  
zaochnogo inzhenerno-stroitel'nogo instituta.  
(Elastic plates and shells)

BEZUKHOV, V.N.

Characteristic dimensions for polycrystalline substances in  
the theory of elasticity and plasticity. Nauch.dokl.vys.shkoly;  
stroj. no.2:115-119 '59. (MIRA 13:4)

1. Rekomendovana kafedroy teoreticheskoy mekhaniki, soprotiv-  
leniya materialov, osnovaniy i fundamentov Vsesoyuznogo zaochnogo  
inzhenerno-stroitel'nogo instituta.  
(Plasticity) (Elasticity)

S/191/63/000/002/010/019  
B101/B186

AUTHORS: Koltunov, M. A., Bezukhov, V. N.

TITLE: Creeping and relaxation of polyamide resin 68 in one-dimensional stretching

PERIODICAL: Plasticheskiye massy, no. 2, 1963, 31-36

TEXT: The problemnaya laboratoriya fiziko-mekhanicheskikh svoystv polimerov mekhaniko-matematicheskogo fakul'teta Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Special Research Laboratory for Physicomechanical Properties of Polymers of the Division of Mechanics and Mathematics of the Moscow State University imeni M. V. Lomonosov) tested the mechanical properties of polyamide resin 68 for machine parts subject to stress and high temperatures. The  $\sigma$ -versus- $\epsilon$  curves for one-dimensional stretching were plotted between 20 and 110°C.  $\sigma$  is directly proportional to  $\epsilon$  up to a relative elongation of 8%. This linear curve section ending with  $\sigma_p$  is followed by an intense flowing at a 10% higher value,  $\sigma_{f1}$ , and rupture occurs at  $\sigma_t$ , the time-dependent

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Creeping and relaxation of ...

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B101/B186

resistance. Hysteresis was observed under alternating stress. Irreversible flowing occurred above  $\sigma_f$ . The following equations hold:

$$\sigma_f = (5.16 - 0.033t/t_0)\sigma_m, \text{ where } \sigma_m = 100 \text{ kg/cm}^2, t_0 = 1^\circ\text{C};$$

$$E = (30 - 0.665t/t_0 + 0.0038t^2/t_0^2)E_0, \text{ where } E \text{ is the elastic modulus,}$$

$$E_0 = 10^3 \text{ kg/cm}^2. \text{ The after-effect is expressed by:}$$

$$\epsilon_r = [-1.3(\sigma/\sigma_t)^2 + 0.245(\sigma/\sigma_t) + 0.1] (\sigma/\sigma_t)\psi(t) \ln(\tau/\tau_0 + 1), \text{ where } \epsilon_r$$

is the residual plastic deformation,  $\tau = \text{time}$ ,

$$\tau_0 = 60 \text{ sec}, \sigma_t = 470 \text{ kg/cm}^2, \text{ and } \psi(t) = \begin{cases} \text{const} = 1 & \text{at } t \leq t_0 \\ (t/t_0)^n & \text{at } t > t_0; n \approx 4. \end{cases}$$

A function of the form  $F(\epsilon_r, \sigma, \tau) = 0$  is derived for the relaxation curves on the basis of the aging theory, and the following is obtained:

$$\int_{\sigma/\sigma_t}^{\sigma/\sigma_t} dz/z^2 (az^2 + \beta z + \gamma) = (E/\sigma_0)\psi(t) \ln[(\tau + \tau_0)/\tau_0]. \text{ For resin 68, the}$$

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Creeping and relaxation of ...

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coefficients are  $\alpha = -1.3$ ,  $\beta = 0.245$ ,  $\gamma = 0.1$ ,

$$\psi(t) = \begin{cases} 1 & \text{at } t \leq 50^\circ\text{C} = t_0 \\ (t/t_0)^4 & \text{at } t > 50^\circ\text{C} \end{cases} . \text{ Since the function } \epsilon_r = Q(\sigma, t) \Omega(\tau) \text{ is}$$

not linear it is not possible to find a functional relationship between stress and deformation in the classical Boltzmann-Volterra form. The equations derived are therefore recommended. Conclusion: Resin 68 can be used when the time limit of creep of work is in the order of  $10^2$  hrs, the upper temperature limit  $80-100^\circ\text{C}$ , and the maximum stress 0.1 of  $\sigma_t$  calculated for  $20^\circ\text{C}$ . There are 10 figures and 3 tables. ✓

Card 3/3

KOLTUNOV, M.A.; BEZUKHOV, V.N.

On the thermomechanical properties of caprope. Vest. Mosk.  
un. Ser. 1:Mat., mekh. no.6:51-61 N-D '62. (MIRA 16:2)

1. Kafedra teorii uprugosti Moskovskogo universiteta.  
(Nylon)

KOLTOV, M.A.; BEZUKHOV, V.K.

Modeling of glass reinforced plastics as high-strength structural material. Plast. massy no.00034-39 '64.

(NIRA 583)

BEZUHOVIC-GLAVINIC, DANICA

Bezuhovic-Glavinic, Danica. Neorganska hemija. Za hemisko-tehnoloski otsek industrijskih srednjih tehnickih skola. Umnozeno kao rekopis. Beograd, Znanje, 1950. 376 p. (Inorganic chemistry for chemicochemical classes of the middle industrial technical schools. Diagrns)

SO: Monthly List of East European Accessions, LC, Vol. 3, No. 1, Jan. 1954, Uncl.

USSR/Zooparasitology - Insects.Mites and Insects - Transmitters G-3  
of Pathogenic Agents.

Abs Jour : Ref Zhur - Biol., No 16, 1958, 72330

Author : Ryabykh, L.V., Bezukladnaya, G.S.

Inst : -

Title : On the Fauna of the Mosquitoes of the Genera Aedes and  
Culex in the Zones of the Protective Forest Belts and the  
Open Steppe Landscape of the Voronezh Oblast.

Orig Pub : Zool. zh., 1957, 36, No 8, 1205-1208.

Abstract : Culicid fauna on the territory of the forest belts of the  
Berezovski and Talovski Rayon, and also in the steppe of  
the Talovski Rayon, Voronezh Oblast, is represented by 13  
species (of which 11 species are Aedes and 2 species Cu-  
lex). In the zone of protective forestry these mosquitoes  
are predominant: Ae. excrucians, Ae. maculatus and Ae.  
communis. On the open landscapes Ae. dorsalis, Ae. excru-  
cians, Ae. flavescens, Ae. cinereus and C. molestus are

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- 17 -

USSR/Zooparasitology - Mites and Insects - Transmitters of  
Pathogenic Agents.

G-3

Abs Jour : Ref Zhur - Biol., No 16, 1958, 72330

more numerous. The sequence of the appearance of the  
different mosquito species during the season was consi-  
dered. -- N.Ya. Markovich.

Card 2/2

BEZUKLADNAYA, G. S., POKROVSKAYA, E. I. and RYABYKH, L. V.

"The Repellence of 1-ACYL Tetrahydroquinoline (RP-99) and Mixtures Based on it (RP-201, RP-209, and RP-220) In Respect to Mosquitos Under the Conditions Prevailing in the Forest Landforms of Voronezh Oblast'."

Tenth Conference on Parasitological Problems and Diseases with Natural Reservoirs, 22-29 October 1959, Vol. II, Publishing House of Academy of Sciences, USSR, Moscow-Leningrad, 1959.

Voronezh Medical Institute



RYABYKH, L.V.; BEZUKLADNAYA, G.S.

Studies on the effectiveness of the repellent activity of dimethylphthalate, RP-1 and RP-50 on blood-sucking mosquitoes in the Voronezh region. Med.paraz.iparaz.bol 30 no.2:218-220 Mr-Ap '61. (MIRA 14:4)

1. Iz kafedry biologii Voronezhskogo gosudarstvennogo meditsinskogo instituta (zav. kafedry - prof. Ye.I. Pokrovskaya).  
(INSECT BAITS AND REPELLENTS) (MOSQUITOES)

Bezukladnikov, A

8(2), 9(6)  
AUTHOR:

Anisimov, V. I., Engineer

SOV/119-59-3-13/15

TITLE:

The Inter-university Scientific Conference on New Methods of Measuring Instruments and on the Technical Means of Automation (Mashinostroyeniye i avtomatizatsiya tekhnicheskikh predmetov avtomatiki)

PERIODICAL:

Priborostroyeniye, 1959, Nr 3, pp 30-31 (USSR)

ABSTRACT:

This Conference was held at the Leningradskiy elektrotekhnicheskiy institut im. V. I. Ul'yanova (Leningrad) (Leningradskiy institut elektrotekhnicheskoy fiziki) in November 1959. It was attended by 500 representatives of universities, scientific research institutes, and other organizations. More than 30 lectures were delivered in the main hall. The following subjects were discussed: E. P. Boroditskiy underlined the outstanding importance of automation and of measuring technique for the development of national economy. M. M. Shumilovskiy in his lecture reported on "The Trends in the Development of Methods of Radioactive Control of Production Data" and outlined the extensive

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possibilities of using radioactive methods in such control. Ye. G. Sharnzor and V. I. Mikhator reported on a new method of measuring direct currents with the help of the method of magnetic resonance. M. A. Rosenblat investigated possibilities of the application of magnetic amplifiers in automation and in measuring technique. A. V. Pateyer reported on the present-day state on the prospects of automatic control technique. Ya. Z. Tsyplak investigated some peculiar features of and the prospects offered by automatic pulse systems. The lecture by E. G. Sharnzor dealt with problems of stability of discrete automatic systems. V. B. Ushakov discussed the trends in the development of atmospheric control computers and of computers designed for astronomical use. The report by V. B. Ushakov deals with an electronic analog correlator for the calculation of correlation functions in the investigation of winds in the ionosphere. E. I. Yurgensov reported on the most important methods, which guarantee both an active and passive freedom from disturbances in

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discrete selective systems. Ye. V. Korovin's lecture discussed problems of averaging, differentiation, and balancing of time-dependent functions, which can be represented by electric signals. V. B. Ushakov investigated new computing devices with programmed relays. A. V. Frenke and Ya. K. Pukhin dealt with automatic transformers for automatic control of production processes. V. B. Ushakov and M. K. Kopylov reported on a computer for the automatic centralized control of production specifications. E. I. Pailaov discussed fundamental problems of the theory of automatic measuring instruments with an illustration of the measurement of non-electric quantities. V. I. Tsyplakov dealt with problems of automatic control with high accuracy. D. I. Malov discussed the design of automatic d. c. bridge for digital automation. The participants in the Congress listed above discussed the following subjects (which, however, are not given by the exact wording of the titles): V. A. Ivankov. The planning of measuring elements for

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The Inter-university Scientific Conference on  
Electrical Measuring Instruments and on the Technical  
Means of Automation

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accurate automatic quotient-type meters in digital computations.  
 of A. Kharchenko: Methods of determining the dynamic errors  
 of a magnetic oscilloscope by simulation. P. P. Orlovskiy:  
 Problems in measuring electric quantities at extremely low  
 frequencies by electrical indicating instruments of various  
 systems. L. B. Glikovskiy: Novel types of a. c. compensators.  
 A. S. Kopylovskiy: Novel types of a. c. compensators  
 suited for the non-automatic bridges and a. c. compensators  
 series production. L. G. Polov: Some characteristics of  
 magnet induction motors which can be used in measuring  
 techniques and automation. B. A. Sorokoviy: Ultrasonic  
 pressure- and liquid level gauges. Striptnik: The  
 circuitry of a phase-sensitive commutator. Striptnik: The  
 use of semi-equilibrium bridges. N. P. Suvit: The application  
 of instruments with magnetic bridges, which permit a  
 considerable simplification of the design of the apparatus  
 and the electric supply used in the measurement of non-electric  
 quantities. V. A. Perent: Method of increasing the  
 sensitivity of oxygen gas analyzers. P. V. Kovitvskiy:  
 Design of apparatus for measuring vibration quantities.

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P. V. Kovitvskiy: Main types of non-linear semiconductor  
 resistors and sensitivities of their application to  
 circuitry in automation and measuring technique. G. M.  
 Borogabunzy: Development of measuring amplifiers with  
 semiconductor triodes. V. A. Kozlovskiy: Methods of  
 frequency meter operating according to the precision semiconductor  
 principle. P. G. Sikitin and A. B. Kozlovskiy: Methods of  
 measuring the magnetic field strength by means of bimetal  
 resistors and transducers operating on the Hall effect  
 principle. A resolution was adopted by the closing  
 session of the Conference, which indicates ways of planary  
 report and coordinating scientific research work in the  
 field of automation, electric measuring- and computing  
 technique.

Card 5/5

BEZUKLADNIKOV, A.B.

High-temperature chlorination of ilmenite concentrate. Zhur. prikl.  
khim. 33 no.6:1240-1245 Je '60. (MIRA 13:8)

1. Bereznikovskiy filial Vsesoyuznogo alyuminiyevogo-magniyevogo instituta.  
(Ilmenite) (Chlorination)

S/598/61/000/005/004/010  
D040/D113

AUTHORS: Bezukladnikov, A.B., and Vil'nyanskiy, Ya.Ye.

TITLE: The kinetics of titanium dioxide chlorination in molten chlorides

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy, no. 5, Moscow, 1961. Metallurgiya i khimiya titana, 135-142

TEXT: The purpose of the described laboratory experiments was to study the effect of chlorine and oxygen concentration, and of ferrous and aluminum chlorides forming in the chlorination process of titanium-containing raw materials in a medium of molten chlorides; this effect was not determined hitherto. The initial materials used were: carnallite prepared from pure potassium and magnesium chloride obtained by hot magnesium reduction of  $TiCl_4$ , aluminum chloride; ground petroleum coke;  $FeCl_2$  and  $FeCl_3$  produced by chlorinating metallic iron in carnallite;  $TiO_2$  boiled for two hours in hydrochloric acid and rinsed in distilled water to wash out chlorine ions; commercial chlorine and argon. Undiluted chlorine, chlorine diluted with ar-

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The kinetics of titanium dioxide ...

3/590/61/000/005/004/010  
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gen and air was blown through the melt in the reaction vessel. Observations made at different temperature ranges, proved that the dependence of the chlorination rate on temperature can be described by the Arrhenius equation. No considerable change in the chlorination rate was stated in blowing chlorine diluted by argon to 40% concentration, but further dilution to 20% slowed the chlorination to a half of the rate. Dilution of chlorine by air to oxygen content above 10% speeded up the reaction between  $TiCl_4$  and  $O_2$  but reduced the speed of the chlorination process. Increasing content of  $FeCl_3$  or  $AlCl_3$  in the melt speeded up the chlorination in all the studied conditions and these chlorides proved to be catalysts. A detailed description is also given of experiment techniques and calculations of equilibrium reaction conditions. Conclusions: (1) The rates of petroleum coke burning and of the  $TiO_2$  chlorination process in molten carnallite depend exponentially on temperature and are within the kinetic field; (2) Chlorine concentration in gas mixture lowered below 40% slows down the chlorination rate; (3) Oxygen content in gas mixture above 10% slows down the chlorination process; (4) Additions of ferrous and aluminum chlorides raise the

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The kinetics of titanium dioxide ...

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chlorination rate several times; (5) At 2% by weight of  $\text{FeCl}_3$  in molten carnallite, the  $\text{TiO}_2$  chlorination process passes over from the kinetic to the diffusion field at  $680^\circ\text{C}$ . There are 4 figures and 3 tables.

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S/080/61/034/001/007/020  
A057/A129

52200 1087, 1043, 1155

AUTHORS: Bezukladnikov, A.B., Vil'nyanskiy, Ya.Ye.

TITLE: Effect of the Chlorides of Iron and Aluminum on the Chlorination  
Rate of Titanium Dioxide

PERIODICAL: Zhurnal Prikladnoy Khimii, 1961, Vol. 34, No. 1, pp. 49-53

TEXT: Chlorination of titanium-bearing slags in molten chlorides (carnallite) is currently being introduced into industry. Amongst other questions the effect of iron and aluminum chlorides on the chlorination kinetics of titanium oxides is important. This question was investigated in the present paper and the results of laboratory experiments are presented. Chlorination was carried out with 100% chlorine gas at 500<sup>o</sup>-900<sup>o</sup>C. 150 g carnallite (0.20% Mg, 0.0005% Fe and 0.001% TiO<sub>2</sub>) was mixed in a quartz tube with 1.6 g dried petroleum coke and melted at 700<sup>o</sup>C during 1 hr, introducing chlorine gas at a rate of 4.5 l/hr. Then a dried mixture containing 1.6 g TiO<sub>2</sub> and 0.4 g coke were added after adjusting the heating to the temperature of the experiment. TiCl<sub>4</sub> evolved was absorbed in diluted H<sub>2</sub>SO<sub>4</sub>. The chlorination  
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X

Effect of the Chlorides of Iron and Aluminum on the Chlorination Rate of Titanium Dioxide

kinetics was investigated without additions of  $\text{FeCl}_3$  or  $\text{AlCl}_3$ . Reaction between the latter and suspended  $\text{TiO}_2$  particles was studied by chlorination of molten carnallite (containing 2 g coke) during 1.5 hr at  $750^\circ\text{C}$ . After this period carnallite melt containing  $\text{FeCl}_3$  (10 g) or  $\text{AlCl}_3$  (24.6 g) was added, and after 10-15 min the first sample was taken. Then 3 g  $\text{TiO}_2$  and 1 g coke was added and 3 g samples of the melt were periodically analyzed. The obtained results demonstrate (Fig.2) that in the first 15 min at low temperatures ( $500^\circ$  and  $600^\circ\text{C}$ ) the chlorination rate is high. This stage of chlorination was not taken into account in calculations of the medium chlorination rate (Fig.3). The results indicate that chlorination rate in the molten carnallite depends on the temperature of the bath. According to the slope of the curve 1 in Fig.3 the authors assume that chlorination at the investigated temperatures occurs in the kinetic range. Dependence of the chlorination rate constant on temperature is given by:  $\log K = 4.114 - 11,200/4.574T$  ( $11,200 =$  apparent activation energy). The results obtained for the chlorination of  $\text{TiO}_2$  with  $\text{FeCl}_3$  and  $\text{AlCl}_3$  admixtures (Fig.4 and 5) demonstrate

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A057/A129

## Effect of the Chlorides of Iron and Aluminum on the Chlorination Rate of Titanium Dioxide

that the chlorination rate increases with the concentration of these admixtures. A considerable increase in the  $\text{FeCl}_3$  and  $\text{AlCl}_3$  content at the end of reaction indicates that exchange reaction according to E.I. Krech [Ref.1: ZhOKh, VII, 8, 1249 (1937)] may occur. Experiments on the chemism of the reaction show (Fig.6) that at a concentration of 0.4%  $\text{TiO}_2$  practically all ferrous chloride changes into ferri chloride. With decreasing  $\text{TiO}_2$  the  $\text{FeCl}_3$  content increases. Apparently the following reaction takes place:

$4 \text{FeCl}_3 + \text{TiO}_2 + \text{C} \longrightarrow \text{TiCl}_4 + 4 \text{FeCl}_2 + \text{CO}_2$ ,  $2 \text{FeCl}_2 + \text{Cl}_2 \longrightarrow 2 \text{FeCl}_3$ . Exchange reaction with  $\text{AlCl}_3$  (Fig.7) occurs until  $\text{Al}_2\text{O}_3$  is formed. With decreasing  $\text{TiO}_2$  concentration the content of  $\text{AlCl}_3$  increases due to the chlorination of  $\text{Al}_2\text{O}_3$ . Thus  $\text{AlCl}_3$  and  $\text{FeCl}_3$  are catalysts for the  $\text{TiO}_2$  chlorination. Catalysis of iron compounds in chlorination of oxides was observed already by Ashkroft [Ref.2: V.M. Gus'kov, Sistematischeskoye sobraniye patentov (Systematic Collection of Patents) GONTI (1938)]. Chlorinations of  $\text{TiO}_2$  in carnallite melt at  $500^\circ\text{C}$ - $900^\circ\text{C}$  with 2%  $\text{FeCl}_3$  demonstrated (Fig.3, curve 2) that at  $680^\circ\text{C}$  chlorination changes from the kinetic to the diffusion range

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Effect of the Chlorides of Iron and Aluminum on the Chlorination Rate of Titanium Dioxide

and the apparent activation energy decreases from 7,340 cal to 770 cal. The obtained results indicate that above 680°C intensification of mixing of the melt is advantageous since a better mass exchange takes place. The chlorination rate can be increased not as much by raising the temperature, but by increasing the content of FeCl<sub>3</sub> or AlCl<sub>3</sub> in the melt. There are 7 figures and 2 references: 2 Soviet-bloc.

ASSOCIATIONS: Bereznikovskiy filial VAMI (Berezniki branch of the All-Union Aluminum and Magnesium Institute) and Ural'skiy politekhnicheskii institut (Ural Polytechnical Institute)

SUBMITTED: February 24, 1960

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S/080/62/035/011/002/011  
D444/D307

AUTHOR: . Bezukladnikov, A.B.

TITLE: Chlorination of titanium slags in fused carnallite

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 11, 1962,  
2380 - 2385

TEXT: This is a promising method for the industrial production of titanium tetrachloride. The present work gives results of a study of some factors influencing such a process. The slag used contained 82 %  $TiO_2$ , 4.24  $Al_2O_3$ , 3.86  $Fe_2O_3$ , 2.1  $SiO_2$ , 1.7  $MnO_2$ , 4.12  $MgO$  and 0.3 V. The reducing agent was petroleum coke (97 % C). The reaction was effected in a stirred quartz vessel.  $TiCl_4$  vapor was absorbed in dilute sulphuric acid, the titanium concentration in which was taken as the measure of the chlorination reaction. The reaction rate fell sharply as the coke particle size was decreased from 800 to 50  $\mu$ , but a further decrease to 25  $\mu$  had little effect. The outside of coke particles is more active than their inside surfaces; ionic oxygen or oxygen-containing groups probably participate. ✓

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Chlorination of titanium slags ...

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te in oxygen transfer to the latter. The rate of chlorination of  $TiO_2$  related to unit surface of slag particles fell as the particle size was reduced, probably owing to changes in physical properties (e.g. apparent viscosity) of the suspension. The overall  $TiO_2$ -chlorination rate rose when slag and coke particle surface areas were increased to 7000 and 9000  $cm^2$  respectively, per 90 g of melt, falling with a further surface increase. An increase in the content of dispersed silica in the melt reduced the chlorination rates. The rate of the overall chlorination process is controlled by convective mass transfer in the melt. The optimum slag and coke contents in the melt depend on particle size. There are 5 figures and 2 tables.

ASSOCIATION: Bereznikovskiy filial Vsesoyuznogo alyuminiyevomagniyevogo instituta (Bereznikovsk Branch of the All-Union Aluminum-Magnesium Institute)

SUBMITTED: August 30, 1961

Card 2/2

S/080/63/036/002/016/019  
D204/D307AUTHOR: Bezukladnikov, A. B.

TITLE: Chlorination of titania with aluminum chloride in molten carnallite

PERIODICAL: Zhurnal prikladney khimii, v. 36, no.2, 1963, 451-453

TEXT: The author used molten carnallite containing 74.9% of pure  $\text{AlCl}_3$  and 0.011%  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$  containing (%) 0.0014 Mg, 0.0014 Ca, 0.049 Si, 0.007 V, <0.006 Al, and 0.001 Fe. The initial melt was chlorinated with gaseous  $\text{Cl}_2$ , freed from excess  $\text{Cl}_2$  by bubbling with deoxygenated  $\text{N}_2$ , and treated with  $\text{TiO}_2$ . The melt was then cooled, dissolved in 3% HCl and analyzed: the filtrate for Ti and Al, the residue for  $\text{Al}_2\text{O}_3$  and  $\text{TiO}_2$ . The temperature of the melt was varied from 610 to 760°C. It was found that above 610°C  $\text{AlCl}_3$  reacted with  $\text{TiO}_2$  to give  $\text{TiCl}_4$  and a mixture of  $\alpha$ - and  $\gamma$ -alumina,

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Chlorination of titania ...

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and the rate became considerable at 640°C and above. The mechanism of this reaction changes at 670°C, the energy of activation decreasing from 104 to 11.3 kcal/mole. The rate is also increased a few times when nitrogen is bubbled through the melt. There are 3 figures and 1 table.

SUBMITTED: August 30, 1961

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REZNIKOV, I.L.; BEZUKLADNIKOV, A.B.; UKSHE, N.S.; GLADYSHEV, A.F.; ZEEYANOV, S.P.;  
KURMAYEV, R.Kh.

Formation of phosgene during the chlorination of titanium slag in  
electric shaft furnaces and chlorinators. Titan i ego splavy no.9:  
140-146 '63. (MIRA 16:9)  
(Titanium—~~Metallurgy~~) (Chlorination)  
(Phosgene)



BEZUKLADNIKOV, D. A.

SHILOVOSOV, M.A.; HUDNYI, N.M., kandidat tekhnicheskikh nauk, rezensent; BEZUKLADNIKOV, D.A., dotsent, redaktor; STUDNITSYN, B.P., redaktor; DUGINA, N.A., tekhnicheskiiy redaktor

[Electric control and measuring instruments; repair and testing]  
Elektricheskie kontrol'no-izmeritel'nye pribory; remont i ispytaniya. Izd.2-e, isprav. i dop.Moskva,Gos.nauchno-tekhn. izd-vo mashinostroit.lit-ry, 1955. 404 p. (MLBA 8:10)  
(Electric measurements) (Electric controllers)

SHILONOSOV, Mikhail Alekseyevich; BEZUKLADNIKOV, D.A., dotsent, red.;  
NIKITIN, P.G., kand.tekhn.nauk, red.; DUGINA, N.A., tekhn.red.

[Electric checking and measuring equipment; equipment of electric engineering laboratories, repair of testing of apparatus] Elektricheskie kontrol'no-izmeritel'nye pribory; oborudovanie elektro-tekhnicheskikh laboratorii, remont i ispytanie apparatury. Izd.3, perer. i dop. Moskva, Gos.nauchno-tekhn.isd-vo mashinostroit. lit-ry, 1959. 448 p. (MIRA 13:5)  
(Electric testing) (Electronic apparatus and appliances)

NIKITIN, P.G., kand.tekhn.nauk; BEZUKLADNIKOV, D.A., starshiy prepodavatel';  
YUSHMANOV, Yu.I., inzhener.

Using bismuth resistances and Hall e.m.f. pickups in measuring  
large direct currents. Izv.vys.ucheb.zav.; prib. 2 no.5:  
26-31 '59. (MIRA 13:5)

1. Ural'skiy elektromekhanicheskiy institut inzhenerov  
zheleznodorozhnogo transporta; Ural'skiy politekhnicheskiy  
institut imeni S.M.Kirova. Rekomendovana kafedroy teoreticheskikh  
osnov elektrotehniki.


(Electric measurements)

S/196/61/000/009/041/052  
E194/E155

AUTHORS: Bezukladnikov, D.A., and Nikitin, P.G.

TITLE: A new circuit for testing d.c. measuring transformers

PERIODICAL: Referativnyy zhurnal, Elektrotehnika i energetika,  
no.9, 1961, 39, abstract 9I 249. (Tr. Ural'skogo  
politekhn. in-ta, Sb.77, 1960, 249-259)


TEXT: In testing d.c. transformers it is often necessary, instead of using the requisite high value of direct primary current, to use a considerably smaller current passed through an auxiliary winding on the d.c. transformer. It is proposed to do away with the auxiliary winding and to apply the direct current to the transformer secondary circuit, which also carries alternating current. A direct-current source (the authors used a rotary convertor) is connected to the mid-point of the secondary winding of the supply transformer (which applies alternating voltage to the d.c. transformer) and also to the primary winding of the current transformer which is used to measure the alternating current in the secondary winding. This current transformer is connected between the secondary windings of both cores of the d.c.   
Card 1/2

A new circuit for testing d.c. ...

S/196/61/000/009/041/052  
E194/E155

transformer. Although direct current flows through the primary winding of this transformer its direction is different in the two halves of the winding and, therefore, it does not magnetise the current transformer core (provided the current in the two halves of the winding is suitably matched by inserting resistance in one of the halves). The circuit was checked experimentally on a d.c. transformer made in the Ural'skiy filial (Ural Branch) of VNIIM with a ratio of 5000/5 A, with a core of cold-rolled steel. At a secondary voltage of 95 - 100 V and currents of 0.2, 0.4, 0.6 and 1.0 times rated value, this method gives respectively errors of 5, 1.4, 0 and -0.9%. The corresponding values, if auxiliary windings are used, are 7.5, 1.4, -0.2 and -1%. The article describes and illustrates by example a semi-graphical method of determining points on the curve of secondary current as functions of time. The method is based on: 1) the differential equation of the secondary circuit of the d.c. transformer; 2) generalised characteristics or magnetisation curves of d.c. transformer cores in which the individual sections of the magnetisation curve are represented by straight lines; and 3) by test oscillograms.

Card 2/2 [Abstractor's note: Complete translation.]



TARASOV, N.M., kand. tekhn. nauk; BEZUKLADNIKOV, D.A., inzh.

Experimental determination of the instantaneous power of electric  
motors. Trudy Ural. politekh. inst. no.112:116-124 '61.

(MIRA 16:7)

(Electric motors)

BEZUKLADNIKOV, D.A.; SKURIDIN, V.P.

Device for measuring heavy direct currents. Izv.tekh. no.5:35-36  
My '63. (MIRA 16:10)

BEZUKLADNIKOV, F.D., insh.; ZAYATS, B.M.

Continuous iron casting into conveyed molds. Bezop. truda v prom. 2 no.11:  
28-29 N '58. (MIRA 11:11)

1. Sverdlovskiy parovozoremontnyy zavod.  
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*BEZUKLADNIKOV, M.A.*

GOL'DSHTEYN, Yakov Yefimovich; GORBUL'SKIY, Il'ya Yakovlevich; PYATAKOVA, Lyudmila Leonidovna; KUDRYAVTSEV, I.V., doktor tekhn.nauk, retsenzent; BEZUKLADNIKOV, M.A., inzh., red.; DUGINA, N.A., tekhn.red.

[Increasing the wear of tractor parts] Povyshenie dolgovechnosti traktornykh detalei. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1956. 225 p. (MIRA 11:1)  
(Tractors--Maintenance and repair)

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FEDOROV, Boris Fedorovich; BEZUKLADNIKOV, M.A., inzhener, redaktor; NOVIKOV, M.P., kandidat tekhnicheskikh nauk, retsenzent; SARAFANNIKOVA, G.A., tekhnicheskikiy relaktor.

[Mechanizing the work of machinists and fitters in assembly operations]  
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(MIRA 10:5)

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VAGANOV, Aleksandr Konstantinovich; BEZUKLADNIKOV, M.A., inzh., red. vypuska; ALEKSEYEV, G.P., inzh., red.; BUSHOLEV, N.M., kand. tekhn.nauk, red.; KUZ'MOV, N.T., inzh., red.; PICHAK, F.I., kand.tekhn.nauk, red.; POLKANOV, I.P., kand.tekhn.nauk, red.; DUGINA, N.A., tekhn.red.

[Efficient use of tractor diesel engine] Kak luchshe ispol'zovat' dvigatel' dizel'nogo traktora. Izd.2., dop. Moskva, Gos. nauchno-tekhn.izd-vo mashinostroit.lit-ry, 1959. 110 p.

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(Tractors--Engines)

DAVIDOV, Ivan Semenovich; OKULOV, Igor' Borisovich; PODGORNOV, S.V., inzh.,  
retsenzent; BEZUKLADNIKOV, M.A., inzh., vedushchiy red.; YERMAKOV,  
N.P., tekhn.red.

[Tables for the calculation of the weight of metals and metal  
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Izd.3., ispr. i dop. Moskva, Gos.nauchno-tekhn.izd-vo mashino-  
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Viktor Ivanovich; PICHAK, F.I., kand. tekhn. nauk, red.;  
BEZUKLADNIKOV, M.A., red.; YERMAKOV, N.P., tekhn. red.

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MASLICH, G.Ye.; RADUKIN, V.P.; ROZENBERG, I.A.; SMIRNITSKIY,  
Ye.K.; PRUDENSKIY, G.A., retsenzent; NEYMARK, A.I., doktor  
tekhn. nauk, prof., retsenzent; ~~BEZUKLADNIKOV, M.A., inzh.,~~  
ved. red.; DUGINA, N.A., tekhn. red.

[Economics of machinery manufacturing; the organization and  
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zatsiia i planirovanie predpriatii. [By] A.M.Vershinin i dr.  
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Literature on the parasitology of Kazakhstan. Part 4: Parasitic  
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1. Akademiya nauk Kazakhskoy SSR, Alma-Ata. Institut zoologii.  
(Bibliography--Kazakhstan--Parasitology)

COUNTRY : USSR.  
CATEGORY : Zoological Parasitology. Acarids and Insects as  
as Disease Vectors. Insects.  
ABS. JOUR. : REhbiol., No. 14, 1958, No. 62665.  
AUTHOR : ~~Bazukladnikova, N. A.~~  
INST. : Institute of Zoology AS KazSSR.  
TITLE : Concerning the Lice Fauna of the Wild Animals  
in Kazakhstan.  
ORIG. PUB. : Tr. In-ta zool. AN KazSSR, 1957, 7, 289.  
ABSTRACT : For the first time, there were collected Poly-  
plax ellobii from the mole-rat, Linognathus  
from the antelope Saiga tatarica and Polyplax  
serrata from white mice.

CARD: 1/1

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1. Institut krayevoy patologii AN KazSSR i Institut zoologii AN KazSSR.

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ZASUKHIN, D.N., red.; KOVALEVA, I.F., red.

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