

ZAV'YALKIN, N.

Publishing House of the Ministry of Municipal Economy of the R.S.F.S.R.
in 1963. Zhil-komm. khoz. 13 no.2:21 '63. (MIRA 16:3)

1. Glavnyy redaktor Izdatel'stva Ministerstva kommunal'nogo
khozyaystva RSFSR.

(Municipal services—Periodicals)

KRASNOV, Nikolay Petrovich; MAKOVER, Mikhail Danilovich; KOL'GUNENKO, Inna Ivanovna; KRASNOV, Yuriy Matveyevich; CHEREPAKHINA, Anna Nikolayevna; ZAV'YALKIN, H.P., red.; BAKHTIYAROVA, R.Kh. red. izd-va; BOLOTINA, A.V., red. izd-va; ZHAYSHLYAYEVA, I.M., red. izd-va; SMIRNOVA, R.N., red. izd-va; NERONOVA, M.D., red. izd-va; LELYUKHIN, A.A., tekhn. red.

[Home and family life] Dom i byt. Moskva, Izd-vo M-va kommun. khoz.RSFSR, 1962. 315 p. (MIRA 15:11)
(Home economics)

ZAV'YALKIN, N.P., red.; KHENOKH, E.M., tekhn. red.

[Your good friends; essays on the best people in the communal economy] Vashi dobrye druz'ia; ocherki o luchshikh liudiakh kommunal'nogo khoziaistva. Moskva, Izd-vo M-va kommun.khoz,RSFSR, 1961. 67 p. (MIRA 15:7)
(Labor and laboring classes)

ZAV'YALKOV, Afanasiy Georgiyevich; SAVITSKIY, F.I., red.; DUBOVIK,
A.P., tekhn. red.

[Price planning] Planirovanie tsen. Minsk, Izd-vo M-va vysshogo,
srednego spetsial'nogo i professional'nogo obrazovaniia BSSR,
1962. 98 p. (MIRA 15:5)

(Prices)

ZAV'YALOV, A.

Our efficient women workers. Msk.-elev. prom. 30 no.3:5-6
Mr '64. (MIRA 17:4)

1. Nachal'nik Glavnogo upravleniya khleboproduktov Belorusakoy
SSR.

216 YH200, 11

AUTHORS: Zav'yalov, A. and Dumnov, D. 2-2-12/12

TITLE: On the Yearly Accountings of Sovkhozes, MTS's and Kolkhozes for the Year 1957 (O godovykh otchetakh sovkhozov, MTS i kolkhozov za 1957 g.)

PERIODICAL: Vestnik Statistiki, 1958, # 2, pp 94-96 (USSR)

ABSTRACT: The article contains official information from the USSR Central Administration of Statistics regarding the accounting forms for the year 1957. These forms are approved by the USSR Central Administration of Statistics in cooperation with the USSR Ministries of Agriculture and Finance.
The local statistical organs are warned to be more accurate in filling out the yearly forms.

AVAILABLE: Library of Congress

Card 1/1

BALIKHIN, M. Eng., ZAV'YALOV, A., SHISHINGOV, M.

Construction Industry

Experience in economizing materials in construction work. Za ekon. mat. no. 2, Sept. 1952.

Monthly List of Russian Accessions, Library of Congress, December 1952. Unclassified.

MERZLOV, Ye.; ZAV'YALOV, A.; LEBEDEV, N.; LAKTIONOV, A., gruppovoy
inzh. ~~elektromekhanik~~; VERIGO, A., elektromekhanik

Automatic control on ships. Mor. flot 23 no. 12:45 D '63.
(MIRA 17:5)

1. Nachal'nik sluzhby sudovogo khozyaystva Dunayskogo parokhodstva (for Merzlov).
2. Nachal'nik tekhnicheskogo otdela Dunayskogo parokhodstva (for Zav'yalov).
3. Starshiy inzh. NIO Odesskogo vysshego inzhenerenogo morskogo uchilishcha (for Lebedev).
4. Dunayskoye parokhodstvo (for Laktionov, Verigo).

ACC NR: AP6024017

SOURCE CODE: UR/0229/66/000/003/0034/0036

AUTHOR: Zav'yalov, A. A.

ORG: None

TITLE: Automatic temperature control of diesel engine cooling systems for boats with hydrofoils ¹⁴

SOURCE: Sudostroyeniye, no. 3, 1966, 34-36

TOPIC TAGS: automatic temperature control, diesel engine, engine cooling system, servomechanism, negative feedback, thermocouple

ABSTRACT: The author describes an electromechanical automatic control system for the cooling water in high-speed diesel engines used in boats operating on hydrofoils. This control system was tested on a "Raketa" type power boat. An indirect-action automatic regulator with direct feedback was mounted in the closed cooling system of a diesel engine. An electric motor with a reduction gear is used as the servomechanism. A bi-metallic thermocouple is used as the sensing element which controls the electric servomotor through an electromagnetic relay. The system is equipped with direct negative feedback to eliminate natural oscillation in the servomechanism part of the system. Differential control equations are derived as a result of dynamic analysis of the various parts of the system. Expressions are given for the control object, sensing ele- ¹⁴

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UDC: 621.431.74-533.6

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ACC NR: AP6024017

ments and other sections of the system. It is shown that the control object (the cooling system of high-speed small-scale powerful diesels) may be treated as an aperiodic section of the first order. The electromechanical system for automatic temperature control completely satisfies the requirements for maintaining constant temperature under all operating conditions for the main engine. Orig. art. has: 4 figures, 8 formulas.

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

100 AND 2TH ORDER

117 AND 2ND ORDER

PROCESSES AND PROCEDURES INDEX

co

12

Enriching bakery products and pastry in vitamin C. A. Zayzakh and B. Zayzakh. *Soviet Magnesium Akhshobrihenie* 11, No. 9, 44-51(1961); *Chemie Et Industrie* 26, 1192. - Concd. exts. of birch roses or of coniferous needles and birch rose flour were used as sources of vitamin C. By incorporating these into the dough, the bread was given an antiscorbutic value 60% (rye bread) or 70% (wheat bread) that of the product added. Bread and pastry thus prepd. have a characteristic, agreeable taste, recalling that of honey or of cream. A. P. C.

COMMON ILLUSTRATIONS

COMMON VARIABLES INDEX

ASB-3/A METALLURGICAL LITERATURE CLASSIFICATION

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ZAV'YALOV, A.I.

Grinding mill at the Tuchkovo Combine. Stroi. mat. 10 no.10:8
0 '64. (MIRA 18:2)

ZAV'YALOV, A.I., inzh.

Mechanized earthwork. Put' i put. khoz. 8 no.11:20 '64
(MIRA 18:2)

1. Zamestitel' nachal'nika Zaporozhskoy distantzii, Pridneprovskoy dorogi.

ZAV'YALOV, Anatoly Ivanovich; YEROFYEV, I.A., red.; ZAYTSEVA, K.F.,
red.kart; SHCHEPTEVA, T.A., tekhn.red.

[Entertaining questions of a young geographer] Zanimatel'nye
voprosy inogo geografa. Moskva, Gos.uchebno-pedagog.izd-vo
M-va prosy.RSFSR, 1960. 43 p. (MIRA 13:10)
(Geography--Examinations, questions, etc.)

LAZAREVA, N.K.; ZAV'YALOV, A.N.

Causes of the unstable acidity of butyl acetate and their
elimination. *Gidroliz. i lesokhim. prom.* 16 no.7:17-20 '63.
(MIRA 16:11)

1. Dmitriyevskiy lesokhimicheskiy zavod (for Lazareva). 2. Ivanovskiy
khimiko-tekhnologicheskiy institut (for Zav'yalov).

ZAV'YALOV, A.

Newspaper and magazine distributors. Sov. shakh. 11 no.10:
39 0 '62. (MIRA 15:9)

1. Instruktor otdela rasprostraneniya pechati Novomoskovskoy
kentory svyazi, Tul'skaya oblast'.
(Newspaper and periodical circulation)

81742

S/O89/60/008/05/01/008
B006/B056

21.02.00
AUTHORS:

Ibragimov, Sh. Sh., Lyashenko, V. S., Zav'yalov, A. I.

TITLE:

Investigation of the Properties and the Structure of Metals and Some Steels After Their Irradiation With Fast Neutrons

PERIODICAL: Atomnaya energiya, 1960, Vol. 8, No. 5, pp. 413 - 419

TEXT: The authors describe investigations of structure and properties after fast-neutron irradiation and thermal treatment of iron, nickel, molybdenum, and steels of the grades 1X18H9 (1Kh18N9), 1X18H9T (1Kh18N9T), the latter grade contains 0.6% Ti - 1X18H12 (1Kh18N12), 1X18H12M2T (1Kh18N12M2T), this grade contains 2.1% Mo, and 0.5% Ti - and 1X18H17 (1Kh18N17). The C, Cr, Ni, Mo, and Ti contents of these grades are given in Table 1. Samples of these materials, after suitable thermal treatment, are hermetically sealed in 1Kh18N9T steel tubes and conveyed into the core of a BP-2 (BR-2)-type reactor. The integral dose was $1.8 \cdot 10^{20}$ neutrons per cm^2 , the irradiation temperature was 40 - 70°C.

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Investigation of the Properties and the Structure of Metals and Some Steels After Their Irradiation With Fast Neutrons

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S/089/60/008/05/01/008
B006/B056

The properties of the investigated materials before and after irradiation are given in Table 2. It was found that fast neutron irradiation caused an increase in strength, hardness, and electric resistivity as well as a decrease in the relative longitudinal extension. The greatest change was found in molybdenum. For the purpose of the thermal stability of investigating the defects due to radiation, the samples were annealed for 30 minutes at various temperatures. Their microhardness was measured after each annealing (Figs. 1, 2) as well as the resistivity of some samples. Fig. 3 shows the temperature dependence of the electric resistivity of irradiated and non-irradiated molybdenum. Fig. 4 shows the decrease in the microhardness ΔH of irradiated iron with the time τ during which it was exposed to various temperatures. This dependence is theoretically investigated in the following. Fig. 5 shows the theoretical function $\Delta H(\tau)$. Finally, the structure of Fe, Ni, and Mo before and after irradiation as well as after annealing after irradiation is investigated, without any essential structural changes being found (Fig. 7, microstructure of iron). Finally, it was found that the radiative defects leading to an increase in strength are of an essentially different nature

Card 2/3

Investigation of the Properties and the
Structure of Metals and Some Steels After
Their Irradiation With Fast Neutrons

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as those leading to an increase in electric resistivity. The increase in strength of the irradiated material is caused by defects (distortions of first and second kind), which are annealed without diffusion and with activation energies of 16,500 and 28,700 cal/mole, respectively. An increase in strength during the irradiation and the annealing of irradiated materials is not accompanied by a change in their microstructure. The authors thank V. M. Agranovich for discussions. There are 7 figures, 2 tables, and 7 references: 6 Soviet and 1 German.

SUBMITTED: May 28, 1959

Card 3/3

ZAV'YALOV, A.I.

In a high-speed traffic section. Put' 1 put.khoz. 5 no.10:12-13
0 '61. (MIRA 14:10)

1. Nachal'nik Rzhavskoy distantzii puti, Yuzhnoy dorogi.
(Railroads--Maintenance and repair)

RAGINSKIY, S.A., inzh., Prinsipalni uchastnye: KOVALEV, K.V.; ZAV'YALOV,
A.M.; VATSEBKO, A.S., kand.tekhn.nauk, nauchnyy red.; PAKHOMOVA,
M.A., red.izd-va; SHERSTNEVA, N.V., tekhn.red.

[Masonry work and assemblage of precast construction elements]
Kamennye raboty i montazh sbornykh konstruksii. Moskva, Gos.
izd-vo lit-ry po stroit., arkhitekt. i stroit.materialam, 1960.
253 p. (MIRA 13:7)

1. Akademiya stroitel'stva i arkhitektury SSSR. Institut organizatsii, mekhanizatsii i tekhnicheskoy pomoshchi stroitel'stvu.
2. Instruktory peredovykh metodov truda Glavmosstroya (for Kovalov, Zav'yalov).

(Precast concrete construction)

(Masonry)

18(5)

SOV/128-59-6-2/25

AUTHOR: Kvasman, M.G., Zav'yalov, A.M. and Tunik, A.A., Engineers

TITLE: Some Factors Affecting the Quality of Cast Iron Crankshafts

PERIODICAL: Liteynoye Proizvodstvo, 1959, Nr 6, pp 4-5 (USSR)

ABSTRACT: Pouring of crankshafts for diesel engines is a complicated process. In the following, several test results obtained by the working group of a metallurgical plant during 1958 are published. They were made to find the reasons for damage to the individual components of the crankshafts in connection with their design and their chemical properties. These defects or damages are: blisters and porous areas, the appearance of which is linked to their heat treatments. Diesel engines of the type 2 D 100 have two crankshafts: the lower one with a length of 3.860 mm (weight 1,740 kg), and the upper one with a length of 3.750 mm (weight 1.490 kg). (a drawing of the crankshaft is given on page 3 of this periodical)

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SOV/128-59-6-2/25

Some Factors Affecting the Quality of Cast Iron Crankshafts

dical). It is a crankshaft made from alloyed cast iron (alloyed with Mo, Ni, Cr, etc.). (At this time the plant is carrying out experiments to produce such crankshafts from magnesium type cast iron). The defects appearing have been observed at this plant for over a year. From one table it is clear that not one single bearing area of the connecting rods big end bearings has been without defect. The number and the location of the defects differ at the different big end bearings. To demonstrate that not the temperature of pouring, but the chemical properties of the casting material have been the reasons for such defects, a crankshaft had been produced from sulphurous cast iron of the type S Ch 21-40. Neither blisters nor porous areas had been detected on this casting. In 1957, the observations showed that the number of the defects increased with the increase of the C and Si (especially C 3 Si) contents of the material. One table lists the results of the observations during 1957 and 1958 for comparison.

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SOV/128-59-6-2/25

Some Factors Affecting the Quality of Cast Iron Crankshafts

There are 3 tables, 1 diagram and 3 graphs.

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ZAV'YALOV, A.N.

Continuous vapor-phase catalytic production of butyl acetate.
Gidroliz. i lesokhim.prom. 14 no.4:18-20 '61. (MIRA 14:5)

1. Dmitriyevskiy lesokhimicheskiy zavod.
(Acetic acid)

ZAV'YALOV, A.N.; KURANOVA, A.V.

Removal of oxidizable matter from acetic acid. *Gidroliz. i lesokhim.prom.*
13 no.7:17-20 '60. (MIRA 13:10)

1. Dmitriyevskiy lesokhimicheskiy navod.
(Acetic acid) (Wood distillation)

ZAV'YALOV, A.P.

USSR/Chemical Technology -- Chemical Products and Their Application. Pesticides,
I-7

Abst Journal: Referat Zhur - Khimiya, No 1, 1957, 1498

Author: Mauyer, F. M., Matveyev, M. A., Abramova, L. A., and Zav'yalov, A. P.

Institution: Academy of Sciences Uzbek SSR

Title: New Chemicals for the Defoliation of the Cotton Plant

Original

Periodical: Izv. AN UzSSR, 1956, No 1, 15-22 (summary in Uzbek)

Abstract: The utilization of magnesium chlorate (I), sodium ethyl xanthate (II), endothal (III), and an emulsion of pentachlorophenol (IV) in the defoliation of cotton plants is described. A suspension of a mixture of 1% calcium cyanamide (V) and 0.6% sodium fluorosilicate (VI) in water was used as a standard. When the treatment was carried out in a 0.4 solution of I, defoliation after 10 days attained 95-100%; the standard (S) gave 50-81%. When large-scale tests were carried out with the utilization of crop dusting techniques and an application dose of 200 l/ha, 73-76% defoliation was observed.

Card 1/2

USSR/Chemical Technology -- Chemical Products and Their Application. Pesticides,
I-7

Abst Journal: Referat Zhur - Khimiya, No 1, 1957, 1498

Abstract: Defoliation was observed when 3-4% solutions of I and II as well as a 0.8% of III were used. An emulsion of I gave low yields. Treatment with S (a 15% solution of V to which 5% VI was added) gave defoliation of 59-71%. When the tests were carried out during periods of severe chilling, I alone gave satisfactory results. I also gives satisfactory results when the application dose is reduced to 100 l/ha. III sometimes produces severe burns on the leaves, bolls, and petals.

Card 2/2

S/081/61/000/024/026/086
B138/B102

AUTHORS: Zav'yalov, A. P., Istomina, A. G., Markelov, V. V.

TITLE: Apparatus for the measurement of tritium oxides

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 24, 1961, 172, abstract
24Ye45 (Med. radiologiya, v. 5, no. 12, 1960, 57 - 60)

TEXT: A description is given of a scintillation device based on standard apparatus, by means of which the specific activity of tritium oxides can be recorded up to $1 \cdot 10^{-9}$ counts per ml, and, with some modification, up to $\sim 1 \cdot 10^{-10}$ counts per ml. A block diagram is given and the transmitting element is described. Specimens can be exchanged very rapidly and a minimum amount of time is required to restore the photomultiplier to its working level. The scintillator is a solution of 4 - 5 g paraterphenyl and 0.05 - 0.01 g ПОРОП (POPOP) (1.4-di-[2-(5-oxazole)]-benzene) in 1 l scintillation toluene or scintillation dioxane. The sensitivity of the device and methods of increasing it are considered. [Abstracter's note: Complete translation.]

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SOV/142-58-5-8/23

0(3)

AUTHOR:

Zav'yalov, A.S.

TITLE:

Dielectric Permittivity of a Grid of Thin Conducting Strips

PERIODICAL:

Izvestiya vysshikh uchobnykh zavedeniy - radiotekhnika, 1958, Nr 5, pp 573-578 (USSR)

ABSTRACT:

The author presents a new method of calculating the dielectric shielding factor of artificial dielectrics. The method is used for the calculation of grids of conducting strips. For the calculation, the capacitance of some equivalent condenser with heterogeneity can be brought in. The results of this calculation completely coincide with the results found by experiments, which are given in (Ref.2). The method is used in case the transverse measures of the elements, which consist of artificial dielectrics, are much smaller than the longitude of the waves. The article is recommended by the Kafedra radiofiziki Tomskogo gosudarstvennogo universiteta imeni V.V. Kuybysheva (Chair of Radio-Physics at the Tomsk State University imeni V.V. Kuybyshev). There are 5 figures, 1 graph, 26 equations and 5 English references.

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SOV/142-58-5-8/23

Dielectric Permittivity of a Grid of Thin Conducting Strips

SUBMITTED: March 24, 1958

Card 2/2

ZAV'YALOV, A.S.; MIRONOV, V.L.

Dispersive features of a ribbed slot-type delay system. *Izv. vys. ucheb. zav.; radiotekh. 6 no.1:52-58 Ja-P '63.* (MIRA 16:3)

1. Rekomendovana Laboratoriyey radiofiziki Sibirskogo fiziko-tekhnicheskogo instituta pri Tomskom gosudarstvennom universitet imeni V.V.Kuybysheva.

(Delay lines)

"APPROVED FOR RELEASE: 03/15/2001

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9(3)

SOV/142-58-6-6/20

AUTHOR:

Zav'yalov, A.S.

TITLE:

The Dielectric Permeability of a Tetragonal Lattice of Conducting Discs (Dielektricheskaya pronitsayemost' tetragonal'noy resh'dtki provodyashchikh diskov)

PERIODICAL:

Izvestiya vysshikh uchebnykh zavedeniy - Radiotekhnika, 1958, Nr 6, pp 669-675 (USSR)

ABSTRACT:

In the article an expression is derived for the effective dielectric permeability of a tetragonal lattice of thin conducting discs, in the case of dense packing of the discs in the lattice. The author states that dense packing of the discs - where the distance between them is less than their diameter - requires that consideration be taken of interaction of higher orders than simple dipole interaction. Computation of the effective dielectric permeability of a tetragonal lattice of discs by means of the molecular theory of dielectrics can be accomplished in a somewhat different formulation.

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SOV/142-58-6-6/20

The Dielectric Permeability of a Tetragonal Lattice of Conducting Discs

The lattice can be considered as a lattice of cylinders, composed of the discs. The author commences with computation of the dielectric permeability of a rectangular lattice of cylinders, and thence derives the expression for the relative dielectric permeability (eq 22). The results of the above computations were compared with the work of M.M.L. Kharadly and W. Jackson [Ref 17], and good coincidence of the computed and experimentally obtained curves was observed with dense packing of the discs. The author attributes observed discrepancies to the presence of multipole interaction between cylinders. Evaluation of multi-pole interaction for a lattice of continuous metallic cylinders leads to another expression (eq 23), a modified form of eq 22. Computation according to eq 23 leads to better coincidence of the computed

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SOV/142-58-6-6/20

The Dielectric Permeability of a Tetragonal Lattice of Conducting Discs

and experimental values. This article was recommended by the Kafedra radiofiziki Tomskogo gosudarstvennogo universiteta (Chair of Radio-Physics of the Tomsk State University). There are 3 diagrams, 2 graphs and 3 references, 1 of which is Soviet and 2 English.

SUBMITTED: March 24, 1958

Card 3/3

S/194/62/000/005/104/157
D230/D308

9,1300

AUTHOR: Zav'yalov, A.S.

TITLE: Slow electromagnetic waves in a ridged structure

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika,
no. 5, 1962, 21, abstract 5zh152 (Tr. Sibirsk. fiz.-
tekh. in-ta, pri Tomskom un-te, 1960, no. 39, 3-17)

TEXT: A study of the propagation of e.m. waves in a system consisting of two parallel plates, one of which has ribs of finite thickness. The dispersion equation of the system is obtained by definition of the electric potential distribution at the input of the groove. It is shown that the use of an approximate boundary condition for the electric potential, simplifies considerably the problem of finding the dispersion equation by the field-joining method. Two special cases are considered: 1) Corrugated waveguide with a small gap between the plane wall and ridges, 2) open-type system of surface waves. The dispersion curves for these special cases are constructed by the method of successive approximations. [Abstractor's note: Complete translation].

Card 1/1

V/E

ZAV'YALOV, A.S.

Electromagnetic surface waves over a multirow comb.
Izv. vys. ucheb. zav.; radiotekh. 5 no.3:390-393 My-Je '62.
(MIRA 15:9)

1. Rekomendovano Laboratorijey radiofiziki Sibirskogo
fiziko-tekhnicheskogo instituta pri Tomskom gosudarstvennom
universitete imeni V.V. Kuybysheva.
(Electromagnetic waves)
(Microwaves)

ZAV'YALOV, A.S.

Approximate calculation of the delay of electromagnetic surface waves
over a plane comb. Izv.vys.ucheb.zav.; radiotekh. 5 no.5:568-576
S-0 '62. (MIRA 15:11)

1. Rekomendovana Laboratoriyey radiofiziki Sibirskogo fiziko-tekhni-
cheskogo instituta pri Tomskom gosudarstvennom universitete imeni
V.V.Kuybysheva.

(Electromagnetic waves)

ZAV'YALOV, A.S. (Moskovskaya oblast')

Treatment of gonorrhoea in men with penicillin and with the patient's
own blood. Vest.ven. 1 dern. 30 no.2:49-50 Mr-Apr '56. (MLBA 9:7)
(GONORRHEA) (PENICILLIN)

ZAV'YALOV, A.S., podpolkovnik meditsinskoy sluzhby

Treating pyoderma by intracutaneous penicillin and novocaine
injections into hyperalgesic areas. Voen.-med.shur. no.10:72-73
0 '56. (MIRA 10:3)

(SKIN--DISEASES) (PENICILLIN) (NOVOCAINE)

ZAV'YALOV, A.S.

Calculation of delay systems with finite width. *Izv. vys. ucheb. zav.; radiotekh. 6 no.5:577-578 S-0 '63.* (MIRA 17:1)

1. Rekomendovano Sibirskim fiziko-tehnicheskim institutom pri Tomskom gosudarstvennom universitete imeni V.V. Kuybysheva.

CR

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Transformations in hypoeutectoid steels during heating.
 A. S. Zav'yakov and Z. N. Krasil'shchikov. *Metallurg* 11, 25-27 (Nov., 1938); *Met. Abstracts (in Metals & Alloys)* 10, No. 5, 278 (1939).—The processes of transformation of steels were investigated during heating in an isothermal medium. Microanalysis and dilatometric studies show that the A_c and A_{c1} points depend not only upon the compn., but also upon the rate of heating in the intercrit. temp. interval (for A_{c1}) and in the subcrit. temp. interval (for A_c). The lower the rate of heating in the intercrit. and subcrit. temp. intervals, the lower will be the positions of A_{c1} and A_c , resp. If there are any carbides present, their crit. temp. of soln. will be affected, not only by the rate of heating but also by the dispersion of the carbides. Heating above this "crit." point will produce considerable changes in the physicochem. properties of the steel, especially the increased stability of the austenite, which is due to the rapid growth of the grain after the carbides have dissolved and the decompn. centers of the austenite have disappeared. C. L. B.

ASST. S. A. METALLOGICAL LITERATURE CLASSIFICATION

PROCESSES AND PROPERTIES INDEX

ca 9

Nitridation of steel. A. S. Zav'yalov. Russ. 55,479, Aug. 31, 1939. Steel articles are heated to the hardening temp. and then subjected to nitridation at the temp. of the highest stability of undercooled austenite.

ASNT-51 METALLURGICAL LITERATURE CLASSIFICATION

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

"On the Theory of Alloying and Heat Treatment of Steels," TsMII NKTP, 1943.

ZAV'YALOV, A. S.

Zav'yalov, A. S. - "Phase diagrams of hardening iron carbide alloys," Trudy Tsentr. nauch.-issled. in-ta (M-vo sudestroit, pri-eti SSSR), No. 6, 1948, p. 3-9 - Bibliog: 5 items.

SO: U-3850, 16 June 53, (Izopis Zhurnal 'nykh Statoy, No. 5, 1949).

ZAV'YALOV, A.S.

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ZAV'YALOV, A.S. Kinetika i mekhanizm prevrashcheniya austenita.
V. SB: Problemy konstruktivnykh stali, M.L., 1949, S. 23-41.

SO: Letopis' Zhurnal'nykh Stat'ey, No. 29, Moskva, 1949

ZAV'YALOV, A. S.

Zav'Yalov, A. S. - "Supersaturated ferrite in iron-carbide alloys," Sbornik nauch.-tekhn. rabot (Vsesoyuz. nauch. inzh.-tekhn. o-vo metallurgov, Leningr. otd-niye, Issue 1, 1949, p. 93-115

SO: U-5240, 17, Dec. 53, (Letopis 'Zhurnal 'nykh Statey, No. 25, 1949).

ZAV'YALOV, A. S.

Zav'Yalov, A. S. - "Phase diagrams for the hardening of iron carbide alloys,"
(With an editorial note), Sbornik nauch.-tekhn. rabot (Vsesoyuz. nauch. inzh.-tekhn.
o-vo metallurgov, Leningr. ots-niye), Issue 1, 1949, p. 148-61

SO: U-5240, 17, Dec. 53, (Letopis 'Zhurnal 'nykh Statey, No. 25, 1949).

ZAV'YALOV, A.S.

PHASE I

TREASURE ISLAND BIBLIOGRAPHICAL REPORT

AID 349 - I

Call No.: TN672.V8

BOOK

Author: ZAV'YALOV, A. S.

Full Title: PROCESSES OF SOLUTION AND SEPARATION OF CARBIDES AT HEAT TREATMENT OF STRUCTURAL STEELS

Transliterated Title: O protsessakh rastvoreniya i obosobleniya karbidov pri termicheskoy obrabotke konstruktsionnykh staley

Publishing Data

Originating Agency: All-Union Scientific Engineering and Technical Society of Machine Builders. Urals Branch

Publishing House: State Scientific and Technical Publishing House of Machine Building Literature ("Mashgiz")

Date: 1950

No. pp.: 12 No. of copies: 3,000

Text Data

This is an article from the book: VSESOYUZNOYE NAUCHNOYE INZHENERNO-TEKHNICHESKOYE OBSHCHESTVO MASHINOSTROITELEY. URAL'SKOYE OTDELENIYE, THERMAL TREATMENT OF METALS - Symposium of Conference (Termicheskaya obrabotka metallov, materialy konferentsii) (p.178-189), see AID 223-II

Coverage: The significance of the processes of solution and separation of carbides on the physico-mechanical properties of alloyed steel is discussed and different experimental processes are described.

O protsessakh rastvoreniya i obosobleniya karbidov
pri termicheskoy obrabotke konstruktsionnykh staley

AID 349 - I

Experimental difficulties in separation of carbides by conventional methods caused inconsistencies in the results obtained by many investigators (Kurdyumov, Kishkin, Isaychev, Arbuzov and others). The author and his associates (Ye. Ya. Poley, T. V. Piradyan and Ya. Ye. Gol'dshteyn) experimented with different alloyed steels melted in the induction furnace, forged and machined to the standard size of the specimen: 14 mm dia. x 52 mm length. The results of the tests and the computed analysis of steels subjected to systematically changed thermal treatment at various temperatures are assembled in three tables.

In discussion, the author mentions two main groups of alloyed steels with and without carbide forming elements. Moreover, the complex and non-uniform carbides are found to contain iron and alloying elements in different proportion depending upon the temperature of treatment. The effects of molybdenum, chromium, tungsten, titanium, niobium, etc. on tempering and characteristics are also discussed.

The complex carbide is found to be not in a chemical compound bound by definite stoichiometric correlation, but is the

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0 protsessakh rastvoreniya i obosobleniya karbidov
pri termicheskoy obrabotke konstruktsionnykh staley

AID 349 - I

representation of the inserted solid solution, the lattice of which is formed by all elements of the composition. Furthermore, atoms of one element may be substituted for by atoms of another element with change of temperature and duration of treatment.

The mechanism of the formation of solid solution is explained as the concentration of large number of carbon atoms, as a result of which increased inner pressure causes a rearrangement of the atoms. The process of solution of carbide is explained as the diffusion of carbon from the carbide phase into surrounding medium and by the reconstruction of atoms into lattice of iron.

The presented study is not completed yet and its results are considered as only of preliminary nature. 5 tables.

Purpose: For scientific workers

Facilities: None

No. of Russian and Slavic References: None

Available: Library of Congress.

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ZAV'YALOV, A. S.

Alloys

Mechanics and kinetics of austenite transformation in ferro-carbon alloys. Zhur. tekhn. fiz. 22, No. 1, 1952.

Monthly List of Russian Accessions, Library of Congress, May 1952, UNCLASSIFIED.

ZAV'YALOV, A. S.

"Discussion: Answer to G. V. Kurdyumov," ZhTF, 22, No. 1, pp 172-174, 1952.

ZAV'YALOV, A. S.

USSR/Metallurgy - Iron-Carbon Alloys, Feb 53
Phase Transformations

"On the Rate of Carbon Diffusion During Phase Transformations in Iron Alloys," A. S. Zav'yalov

Zhur Tekh Fiz, Vol 23, No 2, pp 247-251

Experimentally establishes that rate of C diffusion at phase transformations to distances of hundredths of mm exceeds considerably, many hundreds and even thousands times, rate of C diffusion to greater distances, of one or several mm order, in such

270193

processes as cementation. Assumes that analogical phenomenon must be observed in all other alloys in which solvent and dissolved element form solid solution of implantation.

270193

"APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001964010020-8

APPROVED FOR RELEASE: 03/15/2001 CIA-RDP86-00513R001964010020-8"

ZAV'YALOV, A.S.

Call Nr: AF 1142965

AUTHOR: See Table of Contents

TITLE: Metallography. (Metallovedeniye). Collected Articles (Sbornik statey)

PUB. DATA: Gosudarstvennoye soyuznoye izdatel'stvo sudostroitel'noy promyshlennosti, Leningrad, 1957, 286 pp., 4,000 copies.

ORIG. AGENCY: None

EDITOR: Ed.-in-Chief: Zav'yalov, A. S., Doctor of Tech. Sc., Professor, Ed.: Zhirmunskaya, I. A.; Tech. Ed.: Shirokov, P. D.

PURPOSE: The articles contained in this collection were written for specialists in metallography, to acquaint them with the latest findings.

COVERAGE: These 16 papers represent Soviet contributions. For coverage and references see Table of Contents.

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Call Nr: AF 1142965

Metallography. Collected Articles (Cont.)

TABLE OF CONTENTS

Pashkov, P. O., Doctor of Tech. Sc., Professor, Bratukhina, V.A.,
Engr. Structure and Brittleness of Steel 3

There are 23 references, 19 of which are Russian,
4 English.

Nemchinskiy, A. L., Candidate of Tech. Sc. Experi-
mental Study on the Formation of Cracks During
Quenching 17

There are 7 references, 5 of which are Russian,
2 English.

Nemchinskiy, A. L., Candidate of Tech. Sc. Resistance
of Steel to Cracking During Quenching 42

There are 29 references, 23 of which are Russian,
6 English.

Shimelevich, I. L., Candidate of Tech. Sc. Static
Stress Fatigue Tests on Notched Specimens 70

Card 2/6

Call Nr: AF 1142965

Metallography. Collected Articles (Cont.)

There are 5 references, 4 of which are Russian, 1 German.

Shimelevich, I. L., Candidate of Tech. Sc. Extent of Cracking in Steel Sheets Due to Internal Stresses . . . 81

There are 14 references, 10 of which are Russian, 3 English, and 1 German.

Shurakov, S. S., Candidate of Tech. Sc. Yield Strength of Tempered Steel as a Temporal Function of the Load . . 100

There are 37 references, 28 of which are Russian, 9 English.

Zav'yalov, A. S., Doctor of Tech. Sc., Professor, Gol'dshteyn, L. Ya., Engr., Senchenko, M. I. Nature of Tempering (Heat) Embrittlement 127

There are 12 references, all Russian.

Card 3/6

Call Nr: AF 1142965

Metallography. Collected Articles (Cont.)

Gorynin, I, V., Candidate of Tech. Sc. Effect of Hardening on Low-Carbon Steel Embrittlement 145

There are ¹⁰ references, 8 of which are Russian, 1 English, 1 German.

Gorynin, I. V., Candidate of Tech. Sc. Effect of Work Hardening on Cold Deformed Low-Carbon Steel 155

There are 5 references, all Russian.

Pashkov, P. O., Doctor of Tech. Sc., Professor. Yield Strength Limits and the Creep Area Under Stress 162

There are 39 references, 23 of which are Russian, 2 German, 14 English.

Moroz, L. S., Doctor of Tech. Sc., Khesin, Yu. D., Eng., Mingin, T. E., Eng., and Chern. tsov, V. I., Eng. Yield Strength Point of Titanium 175

There are 18 references, 13 of which are Russian, 3 English, 2 German.

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Call Nr: AF 1142965

Metallography. Collected Articles (Cont.)

Chechulin, B. B., Candidate of Tech. Sc., and
 Syshchikov, V. I., Eng. Cycle Stress Fatigue Resist-
 ance of Titanium 196

There are 11 references, 3 of which are Russian,
8 English.

Zav'yalov, A. S., Doctor of Tech. Sc., Professor,
 Bruk, B. I., Candidate of Tech. Sc. X-ray Tests of
 Carbon Distribution in Ferro-Alloys 206

There are 26 references, all Russian.

Zav'yalov, S. A., Doctor of Tech. Sc., Professor,
 Palsey, E. Ya., Eng. Structural Steel Carbide Types
 and Their Formation and Solution Processes 220

There are 12 references, 11 of which are Russian,
1 English.

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Kaptyug, I. S., Candidate of Tech. Sc. Laminated
 Woody Fractures in Steel 253

Call Nr: AF 1142965

Metallography. Collected Articles (Cont.)

There are 22 references, 19 of which are Russian,
2 German, 1 English.

Andreyev, I. A., Professor, Polin, I. V., Candidate
of Tech. Sc. Vacuum Steel Pouring Practice 264

There are no references.

AVAILABLE: Library of Congress

ZAV'YALOV, A.S.

137-58-4-8147

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 4, p 255 (USSR)

AUTHORS: Zav'yalov, A.S., Gol'dshteyn, L. Ya., Senchenko, M. I.

TITLE: The Nature of Temper (Heat) Brittleness [O prirode otpusknoy (teplovoy) khрупkosti]

PERIODICAL: V sb.: Metallovedeniye. Leningrad, Sudpromgiz, 1957, pp 127-144

ABSTRACT: As a supplement to the hypothesis of one of the authors (Zav'yalov, "On the Theory of the Alloying and the Heat Treatment of Steel," TsNII NKTP, 1943) to the effect that temper brittleness (TB) is induced by the appearance of particles of precipitated phases on the boundaries of what had previously been austenite grains, it is postulated that the enrichment of such surfaces in the tempering process by certain elements dissolved in Fe increases the σ_s and diminishes the resistance of these zones to fracture, and this leads to the appearance of TB. This explains the high temperature of TB of high-phosphorus steels, while the absence of carbide particles (K) along the boundaries of the former austenite grains is explained by the mutual dislodging of P and C. In TB due to K precipitation, TB

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137-58-4-8147

The Nature of Temper (Heat) Brittleness

maximums are observed after low-temperature tempering over specific extended periods of time. This is occasioned by the simultaneous processes of precipitation of new particles of K due to the C supersaturating the ferrite and to the dissolution of fine precipitates within the grain and the fact that they come down on the boundaries, which increases the TB, and the processes of K coagulation along the grain boundaries, which decreases it. The mechanism of K redistribution is confirmed by the electron microscope and the electron diffraction camera. Reduction in TB when the duration of pre-tempering over 600° is increased is explained by reduction in the supersaturation of the ferrite by C, coagulation of small K, and enrichment thereof by alloying elements, thereby increasing their resistance to dissolution. See also RzhMet, 1957, Nr 10, abstract 20085.

A. K.

1. Steel--Brittleness--Analysis of heat treatment
2. Steel--Mechanical properties--Effects

Card 2/2

ZAV'YALOV, A. S.

137-58-1-1967

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 1, p 263 (USSR)

AUTHORS: Zav'yalov, A. S., Bruk, B. I.

TITLE: Radiographic Investigation of the Distribution of Carbon in Iron Alloys (Radiograficheskoye issledovaniye raspredeleniya ugleroda v zheleznykh splavakh)

PERIODICAL: V sb.: Metallovedeniye. Leningrad, Sudpromgiz. 1957, pp 206-219

ABSTRACT: The results of an investigation of the distribution of small amounts of C in Fe alloys by autoradiography employing radioactive C^{14} are presented. The following was the percentage content of the alloys: C 0.003-0.05; Cr 0.08-4.6; Ni 0-4; Mn 0-6.3; Si 0.10-4.4; Mo 0-12.5. Radioactive C is introduced in the form of $BaCO_3$ by cementation at $970^\circ C$. Grade MR NIKFI nucleonics film, permitting 100x enlargement, was exposed. A calculation is presented showing that a 10-day exposure for the purpose of obtaining an unmistakable spot in the emulsion will be successful with a localized segment containing C^{14} of about 10^4 interatomic distances. The minimum thickness of the layer of steel enriched by C^{14} should be about 500 interatomic distances.

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137-58-1-1967

Radiographic Investigation of the Distribution of Carbon in Iron Alloys

The nature of the interrelation between the distribution of C on the various conditions of heat treatment and various contents of alloying substances is established: a) if the percentage of alloying and carbide-forming elements and C at a given temperature of heating does not exceed their saturation solubility in Fe, then the C and the inclusions spread relatively uniformly throughout the volume of the grain. The process of redistribution of C in the direction of enriching the grain boundaries is impaired; b) if the concentration of carbide formers exceeds their maximum solubility in Fe, the grain boundaries will become enriched by these elements, and consequently by C as well; c) if the concentration of non-carbide-forming elements does not exceed their solubility in Fe, they will undergo uniform distribution throughout the volume of the grain and will facilitate an increase in C at the boundaries; d) if the concentration of non-carbide-forming elements exceeds their solubility in Fe, the grain boundaries will gain therein and will lose C. Bibliography: 26 references.

V. G.

1. Alloys--Carbon distribution 2. Alloys--Iron distribution 3. Radiography--Applications

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ZAV'YALOV, H.S.

137-58-3-5859

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 3, p 199 (USSR)

AUTHORS: Zav'yalov, A. S., Paley, Ye. Ya.

TITLE: Types of Carbides in Structural Steels and Processes of Their Formation and Dissolution (Tipy karbidov konstruktсионnykh staley i protsessy ikh obrazovaniya i rastvoreniya)

PERIODICAL: V sb.: Metallovedeniye. Leningrad, Sudpromgiz, 1957, pp 220-252

ABSTRACT: The processes of formation and dissolution of carbides in structural steels alloyed with Mn, Cr, W, Mo, V, Ti, and Nb were investigated. Steel samples, which have been tempered and annealed at different temperatures, were subjected to anodic dissolution in an electrolyte containing 3 percent Fe_2SO_4 , 1 percent NaCl, and 0.2 percent of Rochelle salt. The carbide powders precipitated were investigated by means of chemical and X-ray analyses. Types of carbides, as well as temperatures of their formation and dissolution, were established. It is shown that in certain steels the α phase is supersaturated with C even at annealing temperatures around 700°C. The carbides formed in the process of stepwise annealing are of the same type as

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137-58-3-5859

Types of Carbides in Structural Steels (cont.)

those formed in standard annealing processes, but are richer in carbide-forming elements. The process and the mechanism of formation and dissolution of carbides is described.

V. G.

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AUTHOR: Zav'yalov, A.S., Doctor of Technical Sciences, Prof.,
Goldshteyn, L.Ya., Engineer, and Senchenko, M.I.,
Engineer. 129-4-5/17

TITLE: On the problem of temper (thermal) brittleness. (O prirode otpusknoy (teplovoy) khрупkosti).

PERIODICAL: "Metallovedenie i Obrabotka Metallov" (Metallurgy and Metal Treatment) 1957, No. 4, pp. 21 - 30 (U.S.S.R.).

ABSTRACT: On the basis of tests carried out the authors established that the temper (thermal) brittleness is due to enrichment of the boundary zones of what were previously austenite grains by various admixtures; some of the admixtures in the boundary zones are present in the form of isolated phases as, for instance, carbon in the form of carbides, whilst others are present in the dissolved state (for instance, P, however, in the case of high P contents phosphides may form). During enrichment of the boundary zones by admixtures a decrease of the breaking strength of these zones will occur which in many cases is accompanied by an increase of the yield point. As a result of this there will be an increase in the critical temperature of the brittleness of these zones which will bring about brittle fracture of the metal along the boundary zones. If the brittle fracture is not along the

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On the problem of temper (thermal) brittleness. (Cont.)

129-4-5/17
boundaries but along other zones of the grain, it is an indication that these zones were enriched by admixtures which increase the critical brittleness temperature of these zones. Enrichment of the boundary zones by some admixtures may involve a reduction of other admixtures in these zones; for instance, enrichment with P will bring about an impoverishment in C. The fundamental factors which bring about an enrichment of the grain boundaries with admixtures are the following: content of admixtures in the steel above its limit of solubility in the ferrite; over-saturation of the ferrite with admixtures; simultaneous formation and dissolution of chemical compounds of admixtures, for instance, simultaneous dissolution of carbides. All the factors which bring about an increase in the stability of the carbides at a given temperature reduce the tendency of embrittlement of the steel at that temperature as a result of enrichment of the boundary zones with carbon; such effects are particularly manifest for those carbide forming elements for which the temperature of considerable enrichment of the carbides is above the temperature zone which is of interest. All the

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On the problem of temper (thermal) brittleness. (Cont.)

129-4-5/17

factors which bring about a uniform distribution of the admixtures throughout the grain reduce the brittleness of the steel and the tendency of the steel to develop brittle fractures along the grain boundaries. These conclusions are based on earlier work of the authors (5, 6, 9, 10), on literary data and on experiments which are described in this paper. In these, the behaviour of two melts of Cr-Mo steel with various P contents were investigated, the compositions of which were as follows: 0.40% C, 0.28% Si, 0.42% Mn, 0.031% S, 0.028% P, 3.03% Cr and 0.46% Mo; 0.39% C, 0.24% Si, 0.49% Mn, 0.031% S, 0.097% P, 2.87% Cr and 0.41% Mo. The following heat treatment regimes were applied: heating to $A_{c3} + 40^{\circ}C$, quenching in oil, tempering at $650^{\circ}C$ for ten hours followed by quenching in water; same heat treatment with the difference that after tempering the specimens were cooled to $300^{\circ}C$ in the furnace with a speed of $20^{\circ}C/hr$. The results of impact tests are plotted in Fig. 3, p. 24 and these show that the P content has a very pronounced influence on the tendency of the steel to develop temper brittleness. Electron microscopic investigations enabled to establish interesting features of the distribution of carbides in high P content steels after hardening and high temperature tempering. It

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On the problem of temper (thermal) brittleness. (Cont.)
was found that P and C have the tendency of squeezing each
other out. Micro-photos are included for Cr-Ni-Mo high P
content steel (X 1500), of the surface layer of a P satur-
ated carbon steel (X 75) and of titanium preparations of
Cr-Ni-Mo steel (X 11000) and also electron diffraction
pictures of carbides Cr-Ni-Mo steel.
There are 7 tables, 7 figures (graphs and photos) and 10
Slavic references.

AVAILABLE:

Card 4/4

AUTHORS: Zav'yalov, A.S. and Bruk, B. I. 126-1-19/40
TITLE: Radiographic investigation of the distribution of carbon in ferrous alloys. (Radiograficheskoye issledovaniye raspredeleniya ugleroda v zheleznykh splavakh).
PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol.5, No.1, pp. 127-136 (USSR)

ABSTRACT: The problem of the distribution of alloying elements, particularly of carbon in the microscopic zones of α and γ -solid solutions of ferrous alloys, has so far not been solved satisfactorily from the experimental point of view. The nonuniform distribution of individual elements in the microstructure is considered as being of decisive importance from the point of view of the behaviour of metallic alloys. Numerous metallurgists accept the hypothesis of V. I. Arkharov who assumes that in polycrystalline aggregates the Gibbs surface effect extends to layers of a thickness of many atoms; according to this hypothesis, the surface layers of a crystallite are enriched by an admixture which is capable of reducing its free energy and an over-concentration of the admixture in the alloy is sufficient for forming such layers (Refs.1 and 2). In spite of satisfactory inter-

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126-1-19/40

Radiographic investigation of the distribution of carbon in ferrous alloys.

pretation by means of this hypothesis of a number of phenomena taking place during heat treatment, this hypothesis has not been experimentally confirmed. Although mentioned by various authors, the nonuniformity of the distribution of individual elements inside the austenite grains has not been confirmed by direct experiments. In this paper the results are described of investigations of the distribution of small quantities of carbon in alloyed iron, effected by means of autoradiography, using radio-active C^{14} as a tracer element. The investigations were carried out on six types of low carbon steels alloyed respectively with Ni, Cr, Mo, Mn and Si, the analyses of which are given in a table, p.128. The radio-active C^{14} was introduced by means of carburisation at $970^{\circ}C$ with $BaCO_3$ without addition of carbon and, therefore, the increase in the carbon content above the initial value did not exceed 0.03 to 0.05%. The specimens were treated so as to obtain coarse grains (annealing at $970^{\circ}C$ for 50 hours) and to detect more clearly the distribution of the carbon inside the individual crystallites. The

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Radiographic investigation of the distribution of carbon in ferrous alloys.

exposures reproduced in the paper have been obtained after various conditions of heat treatment, i.e. in the annealed state, in the hardened state (quenched in water from 1200 and 900°C respectively) and in the tempered state. On the basis of the established relations between the carbon distribution at various heat treatment regimes and the contents of the above mentioned elements the following can be assumed as being generally valid:

1. If the concentration of the alloying elements in the carbon at a given heating temperature does not exceed the limit solubilities in the iron, the carbon and the alloying elements will be distributed relatively uniformly throughout the grain volume.
2. If the concentration of carbide forming elements at a given heating temperature does not exceed the limit solubility in iron, the elements ^{will be} distributed relatively uniformly throughout the grain volume and thereby will slow down the process of redistribution of carbon (enrichment with carbon of the grain boundaries); if the concentration of carbide forming elements exceeds

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126-1-19/40

Radiographic investigation of the distribution of carbon in ferrous alloys.

the limit solubility at the given temperature, the grain boundaries will become enriched with the respective elements and thus also with carbon.

3. If the concentration of non-carbide forming elements at a given temperature is below the limit solubility, these elements will distribute relatively uniformly throughout the grain volume which will bring about a redistribution of the carbon, namely, enrichment of the grain boundaries with carbon; if the concentration of the non-carbide forming elements exceeds the limit solubility in iron, the grain boundaries will become enriched with these elements and, as a result of this, they will combine with the carbon.

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There are 6 figures, 1 table and 9 references, all of which are Slavic.

SUBMITTED: October 22, 1956.

ASSOCIATION: Central Scientific Research Institute of the Ministry for Ship-Building of the U.S.S.R. (Tsentral'nyy Nauchno-Issledovatel'skiy Institut Ministerstva Sudostroitel'noy Promyshlennosti SSSR).

AVAILABLE: Library of Congress.

ZAV'YALOV, A.S.

AUTHOR

ZAV'YALOV A.S., BRUK B.I.,

TITLE

Distribution of Small Quantities of Carbon in Iron Alloys. 20-1-25/54
(Raspredeleniye malykh kolichestv ugleroda v legirovannom zheleze
-Russian)

PERIODICAL

Doklady Ak.Nauk SSSR, 1957, Vol 115, Nr 1, pp 94 - 96 (U.S.S.R.)

ABSTRACT

The problem of distribution of alloying elements, especially of carbon, on the microscopic α - and δ -section of the solid solution in iron alloys has hitherto not found a convincing experimental solution. In the present work this investigation was performed by autoradiography and the radioactive isotope C^{14} . Low-carbon iron alloys were treated, that is chromium, nickel, silicon- and molybdenum-alloys separately. C^{14} was introduced into the alloys by "cementation" in the environment of radioactive barium carbonate. Since no coal was added, the carbon content did not exceed the already existing 0.03-0.05%. The introduction of C^{14} took place according to a scheme given here. After the prescribed heat-treatment the samples were photographed on a granular film mark NIKFI, type PN. From the consideration of the autoradiograms of the annealed alloys there follows a very marked irregularity of carbon within the area of one grain; it becomes especially noticeable in Fe-Si and Fe-Mo alloys in which C on the whole is concentrated at the grain boundaries. Autoradiograms of alloys quenched in water from a temperature of 950 and 1200° C have a completely uniform darkening in the enlargement used. This indicates that no concentration of C took place at the austenite-grain boundaries.

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Distribution of Small Quantities of Carbon in Iron Alloys. 20-1-25/54.
(in Fe-Cr and Fe-Ni) and at the ferrite-grain boundaries (in Fe-Si and Fe-Mo). Thus the process of C-concentration, identical with regard to its radiographic action, at the boundaries of ferrite-grains in the Fe-Si and in the Fe-Mo alloys is of different nature: In Fe-Si the C is displaced to the grain boundaries by the silicon evenly distributed in the iron. In the Fe-Mo alloys with 12.5% Mo, however, C diffuses towards the grain boundaries because of the isolation of the excess phase at these boundaries which is enriched with molybdenum.
(4 illustrations, 1 table, 8 Slavic references).

ASSOCIATION Tsentral'nyy nauchno-issledovatel'skiy institut Ministerstva sudostroitel'noy promyshlennosti SSSR.
PRESENTED BY KURDYUMOV G.V., Member of the Academy, January 10, 1957
SUBMITTED
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Card 2/2

ZAVYALOV, A. S.

"A Study on Re-Distribution of Elements in Metal Alloys and Weld Joints by
Radiography and Radiometry", by B. Y. Bruk, A. S. Zavyalov, G. I. Kapyrin
Report presented at 2nd UN Atoms-for-Peace Conference, Geneva, 9-13 Sept 1958

ZAV'YALOV, A.S. (Leningrad)

Regularities and nature of the effect of addition elements on
the polymorphism of iron. Izv. AN SSSR, Met. i gor. delo
no.2:92-96 Mr-Ap'54 (MIRA 17:8)

ACCESSION NR: AP4040986

S/0279/64/000/003/0138/0144

AUTHORS: Zav'yalov, A. S. (Leningrad); Sandomirskiy, M. M. (Leningrad)

TITLE: The influence of rare earth elements on the composition of steel

SOURCE: AN SSSR. Izvestiya. Metallurgiya i gornoye delo, no. 3, 1964, 138-144

TOPIC TAGS: rare earth element, lanthanum, cerium, praseodymium, neodymium, iron alloy, thermal working, carbide-forming element

ABSTRACT: The authors studied the effects of the rare earth elements, (lanthanum, cerium, praseodymium and neodymium) on the phase transformation and carbide formation in alloys of iron. For this purpose, casts were made of steels with various compositions. After forging and rolling the ingots, specimens were prepared and subjected to various forms of thermal treatment. They were then treated in electrolytic solutions. Finally, the specimens were subjected to chemical and x-ray analyses. The results of the experiments showed that the rare earth elements in alloys of steel did not form carbides. On the contrary, they displaced the carbon from zones of its high concentration. Rare earth elements narrowed down the range of gamma iron. During surface saturation of the alloy by non-carbide-forming elements, carbon was removed from the surface zone to deeper zones. During saturation by carbide-forming elements, when the temperature of carbide formation was

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ACCESSION NR: AP4040986

lower than the temperature of saturation, diffusion of carbon took place from the deeper zones to the surface zone. In the case when the temperature of carbide formation was higher than the melting point, the diffusion of carbon did not occur. Orig. art. has: 7 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 17Oct63

ENCL: 00

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NO REF SOV: 020

OTHER: 000

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ZAV'YALOV, A.S., prof., doktor tekhn.nauk; BRUK, B.I., kand, tekhn.nauk

Regularities of intercrystalline distribution of elements in
metal alloys. Metallovedenie-2:35-52 '58 (MIRA 13:9)
(Alloys--Metallography) (Crystal lattices)

GOL'DSHEYN, I. Ya., inzh.; ZAV'YALOV, A. S., prof., doktor tekhn.nauk;
STOYANOV, P. A., kand. tekhn.nauk

Characteristics of the fine structure of intercrystallite zones
in the state of temper brittleness. Metallovedenie 2:53-64 '58.
(MIRA 13:9)
(Steel, Structural--Metallography) (Crystal lattices)

ZAV'YALOV, A. S., prof., doktor tekhn.nauk; SENCHEVKO, M. I., insh.

Processes occurring during the tempering of alloyed steels.
Metallovedeniye 2:82-103 '58. (MIRA13:9)
(Steel alloys--Metallography) (Tempering)

ZAV'YALOV, A. S., prof., doktor tekhn.nauk

Martensite and martensite transformations. Metallovedenie 2:135-157
'58. (MIRA 13:9)
(Martensite) (Phase rule and equilibrium)

ZAV'YALOV, A. S.

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PHASE I BOOK EXPLOITATION

SOV/1838

Metallovedeniye; sbornik statey, [vyp.] 2 (Study of Metals; Collection of Articles, [Nr] 2) [Leningrad] Sudpromgiz, 1958. 265 p. 4,000 copies printed.

Resp. Ed.: G.I. Kopyrin, Candidate of Technical Sciences; Ed.: Ye. A. Krugova;
Tech. Ed.: K.M. Volchok,

PURPOSE: This book is intended for metallurgists and metallurgical engineers.

COVERAGE: This is the second volume of collected scientific papers dealing with various problems in physical metallurgy, particularly in mechanical metallurgy and metallography. Topics covered include hydrogen embrittlement, intragranular distribution of elements in alloys, effect of tempering on carbon redistribution, use of tritium to investigate certain phenomena in metals, effect of certain alloying elements on temper brittleness and hardenability of steel, strength of notched specimens of brittle steel, effect of strain hardening on the properties of an aluminum alloy, etc. The articles are concerned mainly with various types of steel, though some deal with nonferrous alloys.

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Study of Metals (Cont.)

during deformation by the application of external forces, leading to local ruptures, or cracks.

Zav'yalov, A.S., Doctor of Technical Sciences, Professor, and B.I. Bruk, Candidate of Technical Sciences. Regularities in the Intragramular Distribution of Elements in Metallic Alloys

35

Authors' conclusions (in part). (1) If at a given temperature the content of an element does not exceed the limit of solubility in the metal solvent, this element is distributed fairly uniformly throughout the crystal, exhibiting no preferred concentration in the peripheral or internal zones of the crystal. (2) If the content of the element is above the solubility limit, the excess quantity of the element will be concentrated along the grain boundaries, either as a phase rich in the particular element or in a structurally free state. Changes in temperature will result in redistribution of the element, depending on its solubility at the given temperature.

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Study of Metals (Cont.)

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(3) In supersaturated (e.g. quenched) solid solutions, phases rich in dissolved elements may, on being heated (as in tempering), separate out fairly uniformly throughout the crystal; later, however, these phases migrate to the grain boundaries or form smaller, structurally free units. (4) In a one-phase alloy in which a new phase is on the point of separating out because of temperature changes or concentration conditions, those components in which the new phase is rich (in comparison with the original phase) will be concentrated along the grain boundaries or the boundaries of smaller structural units (e.g. "mosaic blocks"). (5) The presence of certain elements in the alloy affects the intragranular distribution of others. (6) The tendency of the components of alloys to concentrate along the grain boundaries or, on the contrary, to diffuse away from the periphery towards the central part of the crystal is determined not by any constant property of the given element in relation to its solvent but by (a) the relationship between the concentrations of the components at a given temperature (these relationships being determinable with the aid of a constitution diagram) and (b) the difference in the strength of the bonds between the elements forming the alloy (when the alloy is composed of more than three elements).

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Study of Metals (Cont.)

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Gol'dshteyn, L. Ya., Engineer; A.S. Zav'yalov, Doctor of Technical Sciences, Professor; and P.A. Stoyanov, Candidate of Technical Sciences. Characteristics of the Fine Structure of the Intergranular Zones of Structural Steel Affected by Temper Brittleness

53

Authors' conclusions: (1) Electron diffraction study appears to be an effective means of revealing the difference in the crystal structure of carbides situated on the fracture surface of brittle and tough steel. (2) Carbides situated on the grain boundaries of brittle steel have a structure made up of relatively perfect crystals. (3) This type of structure confirms an idea previously expressed by A.S. Zav'yalov, L.Ya. Gol'dshteyn, M.I. Senchenko, and Ye. Ya. Paley [apparently in No. 1 of the present series] concerning the three stages of carbide formation. A basic point of this idea is that the second stage is concluded by the separation of carbides, i.e., the appearance of a boundary between the carbide particles and the phase in which they originated, and, hence, by the loss of cohesive bonds between them - - a phenomenon especially noticeable around the boundaries of former austenite grains. This, together with changes in concentration and

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Study of Metals (Cont.)

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the development of zones of disintegration and destruction of continuity, constitutes the main reason for the sharp drop in impact toughness and the intergranular character of the fracture. (4) The disintegration of former austenite grains may create favorable conditions for the concentration of alloying elements in the boundary zones. Because of the disappearance of the cohesive bonds between the alpha phase and the carbides separating out during this disintegration, the carbides will inevitably have a structure composed of nearly perfect crystals, a fact which was demonstrated in this investigation. (5) Lacquer films or similar films of amorphous structure are recommended for the electron-diffraction study of isolated particles of any second phase.

Bruk, B.I., Candidate of Technical Sciences, and V.V. Myrkovskaya, Engineer.
Redistribution of Carbon During the Tempering of Chrome-Nickel Stainless Steel

65

Author's conclusion. Application of the autoradiographic method made it possible to demonstrate certain regularities in the redistribution of carbon in 18-8 stainless steel during tempering. In particular it was established that holding this steel for 6 hours at 600° C may lead to the

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Study of Metals (Cont.)

SOV/1838

hydrogen in metals, and the character of the distribution of hydrogen during welding.

Zav'yalov, A.S., Doctor of Technical Sciences, Professor, and M.I. Senchenko, Engineer. Processes Occurring During the Tempering of Alloy Steels

82

Authors' conclusions: (1) Alloying of steel with those non-carbide forming elements which act to reduce the carbon content in the zones in which these elements (e.g. Si, Al) are concentrated will, during the tempering of the quenched steel, raise the initial temperature of all three stages of carbide formation, i.e., raise the temperature of the decomposition of martensite. These elements cause a marked migration of carbon to the grain boundaries, resulting in temper brittleness. (2) In steels alloyed with carbide-forming elements the appearance and separation of carbides of the cementite type may begin at the same temperatures as in carbon steel. But at these temperatures only part of the carbon contained in the martensite may participate in the carbide-forming processes (that part which is most loosely held by carbide-forming elements). The higher the content of carbide-forming elements in the alloy, the less will be the amount of carbon that can separate out in the first stage of tempering, i.e., as cementite, and the greater will be the amount that

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can separate out in the second stage, i.e., as special carbides at temperatures above the initial temperature of separation of the given carbides. (3) In iron alloys containing carbon as well as carbide-forming elements, the alpha phase as a rule remains supersaturated with carbon even after protracted tempering at high temperatures. (4) At those temperatures of tempering where the separation and coagulation of carbides becomes possible, a simultaneous process takes place, namely, solution of the carbides. The first carbides to dissolve are those whose reaction of formation is accompanied by maximum absorption or minimum liberation of heat as well as those which have maximum surface energy. These first carbides are, therefore, those of iron and such others as have a maximum surface-volume ratio. (5) Changes in the mechanical properties of hardened alloy steels during tempering are caused mainly by a drop in the concentration of carbon and the alloying elements in the alpha phase, by the redistribution of carbon and carbides, and by the transformation of residual austenite. (6) Evidence was obtained that temper brittleness and thermal brittleness are one and the same.

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Study of Metals (Cont.)

80V/1838

Zav'yalov, A.S., Doctor of Technical Sciences, Professor. On Martensite and Martensite Transformations

135

Author's conclusions (in part). (1) Martensite in alloys in which interstitial solid solutions are formed cannot be identified with martensite in alloys in which substantial solid solutions are formed. (2) The acicular structure of martensite should not be considered its basic distinguishing feature. In the case of martensite in interstitial solid solutions, the distinguishing feature may be the fact that the martensite is a transformation product which has undergone phase hardening, being a supersaturated interstitial solid solution. (3) Martensite which forms during the continuous cooling of iron alloys which contain carbon is not homogeneous with respect to carbon content. This is a result of the difference in the temperature of formation of the martensite zones differing in carbon content. (4) Below the point M (Fig. 3) the martensite transformation develops not only as a function of the lowering of the temperature but also of the duration of isothermal holding, the latter being especially important at temperatures above T_k (Fig. 3). (5) All phase transformations in iron alloys containing carbon are in cooling preceded by a redistribution of carbon in the austenite, which may take place precisely at the moment

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Study of Metals (Cont.)

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of phase transformation (for example, in the formation of the two-phase pearlite-pseudoeutectoid structure). (6) An intermediate maximum in the stability of austenite in steel alloyed with carbide-forming elements is caused by the delay which these elements bring about in the separation of carbon (as carbides) from the austenite. The average temperature at this maximum is close to or the same as the initial temperature of separation of the special carbides. (7) In steel, and apparently in all alloys in which interstitial solid solutions form, the martensite transformation is irreversible, and the initial temperature of the transformation of martensite to austenite cannot be lower than the critical point A_{c1} . In general, equilibrium cannot exist in these alloys between austenite and any product of its transformation at any temperature below the point A_1 . (8) If martensite is subjected to some degree of tempering at the temperature of its formation or upon being cooled, a product results known as acicular troostite or lower bainite. (9) There are two mechanisms of martensite formation. The first, and more important, consists in the formation and growth of nuclei. The initial temperature corresponds to a point on the martensite curve, showing concentration as a function of temperature. The second mechanism is linked with the occurrence of displacements (slip) in the austenite, caused by the development of stresses.

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ZAVYALOV, A.S.

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PHASE I BOOK EXPLOITATION

BOV/1558

Moscow. Dom nauchno-tekhnicheskoy propagandy im. F.E. Dzerzhinskogo

Sovremennyye splavy i ikh termicheskaya obrabotka (Contemporary Alloys and Their Heat Treatment) Moscow, Mashgiz, 1958. 329 p. 12,000 copies printed.

Additional Sponsoring Agency: Obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy RSFSR.

Ed. (Title page): Yu. A. Geller, Doctor of Technical Sciences; Ed. (Inside book): V.V. Rzhavinskiy, Engineer; Tech. Ed.: B.I. Model'; Managing Ed. for Literature on Metal Working and Tool Making; R.D. Beyzel'man, Engineer.

PURPOSE: The book is intended for engineering and technical personnel of heat-treatment shops and test laboratories of machine-building plants.

COVERAGE: This collection of 28 articles, compiled by 33 authors, aims to acquaint the reader with modern practice in the heat treatment of steels. The authors

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Contemporary Alloys and Their Heat Treatment

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are primarily concerned with the development of various types of structural, tool, and heat-resistant steels and with the use of their alloying elements. Materials-handling equipment is described at some length. The treatment of alloys, particularly those of titanium, also comes within the scope of the collection. The book is thoroughly diagrammed, and a good deal of the material is shown in graphical form. Among the problems dealt with are the minimization of deformations, the introduction of the automatic control of heat-treating equipment, together with fully mechanized tool manufacture, and the optimum proportions of different alloying elements. There are numerous tables and drawings. Bibliographic listings placed at the end of chapters are predominantly Soviet. The articles comprising this collection are reports delivered at a conference held in the Scientific and Technical Propaganda House imeni F.E. Dzerzhinskiy in Moscow.

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