TRUBIKHIN, M.G., kand. ekonom. nauk; FLEYSHMAN, F.M., kand. ekonom. nauk; KREYNIN, A.V., kand. ekonom. nauk; KRISHTAL', I.I., red.

[Principles for the establishment of railroad freight rates in socialist management]. Printsipy postroeniia zheleznodorozhnykh gruzovykh tarifov v sotsialisticheskom khoziaistve. Moskva, Transport, 1964. 46 p. (Moscow, Vsesoiuznyi nauchno-issledovatel'skii institut zheleznodorozhnogo transporta, Trudy, no.278).
(MIRA 17:7)

VINOGRADOV, A.N.; LIVSHIN, G.L.; OBRAZTSOVA, R.I.; TULUPOV, L.P.; Prinimali uchastiye: RAZORENOVA, L.K., inzh.; DUBINKINA, L.I., inzh.; PODGORNYKH, A.L., inzh.; LAVRENT'YEV, K.V., retsenzent; MINAKOV, A.D., retsenzent; NESTEROV, Ye.P., retsenzent; STEFANOV, N.Ya., retsenzent; USHAKOV, P.S., retsenzent; KRISHTAL', L.I., red.; KHITROVA, N.A., tekhn. red.

[Calculating machines in accounting, planning and administration in railroad transportation] Vychislitel'naia tekhnika v uchete, planirovanii i upravlenii na zheleznodorozhnom transporte. [By] A.N.Vinogradov i dr. Moskva, Transzheldorizdat, 1963. 407 p. (MIRA 17:2)

BERLYAND, A.U., otv. za vypusk; KRISHTAL', L.I., red.; VOROTNIKOVA, L.F., tekhn. red.

[Collection of materials on traffic safety; excerpts from orders and instructions issued by the Ministry of Railroad Transportation on traffic safety] Sbornik materialov po bezopasnosti dvizheniia; vyderzhki iz prikazov i ukazanii Ministerstva putei soobshcheniia po bezopasnosti dvizheniia. Izd.2. Moskva, Transzheldorizdat, 1963. 206 p. (MIRA 17:2)

1. Russia (1923- U.S.S.R.) Upravleniye glavnogo revizora po bezopasnosti dvizheniya. 2. Starshiy pomoshchnik glavnogo revizora po bezopasnosti dvizheniya Ministerstva putey soobshcheniya SSSR (for Berlyand).

PETROV, Vsevolod Ivanovich, kand. tekhn. nauk; KRISHTAL', L.I., red.

[Transportation and economic ties of the U.S.S.R.] Transportno-ekonomicheskie sviazi SSSR; sbornik statei. Moskva, Transport, 1965. 170 p. (MIRA 18:4)

1. Moscow. Institut kompleksnykh transportnykh problem.

ZAKHARENKO, Nikolay Nikolayevich; ITKIN, Lev Mendeleyevich; KRISHTAL', L.I., red.

[Ways to increase labor productivity in railroad transportation] Puti povysheniia proizvoditel'nosti truda v khoziaistve dvizheniia. Moskva, Transport, 1964. 151 p. (MIRA 17:12)

PONOMAREV, Sergey Aleksandrovich; KRISHTAL', L.I., red.

[Long-term planning of suburban passenger transportation; in the section and on the railroad as a whole] Perspektivnoe planirovanie prigorodnykh perevozok passazhirov; na otdelenii i zheleznoi doroge. Moskva, Transport, 1964. 34 p. (MIRA 17:11)

VLADIMIROV, V.A.; KRISHTAL', L.I., red.

[Original statistical accounting on railroads] Pervichnyi statisticheskii uchet na zheleznykh dorogakh. Moskva, Izd-vo "Transport," 1964. 57 p. (MIRA 17:7)

PONOMAREV, Sergey Aleksandrovich; KRISHTAL', L.I., red.

[Long-term planning of suburban passenger transportation; on railroad lines and sections] Perspektivnoe planirovanie prigorodnykh perevozok passazhirov; na otdelenii i zheleznoi doroge. Moskva, "Transport," 1964. 34 p. (MIRA 17:8)

KRISHTAL', L.I., red.

[Establishing the norms for industrial supplies of materials and spare parts in locomotive and car depots; methodological manual] Normirovanie proizvodstvennykh zapasov materialov i zapasnykh chastei v lokomotivnykh i vagonnykh depo; metodicheskoe posobie. Moskva, Transport, 1964. 29 p. (MIRA 17:8)

1. Moscow. Vsesoyuznyy nauchno-issledovatel'skiy institut zheleznodorozhnogo transporta.

PETROKANSKIY, B.I.; ZVEREV, N.P., retsenzent; MIZIN, V.I., retsenzent; PETROV, A.I., retsenzent; KRISHTAL', L.I., red.

[Statistical accounting and the work analysis of a railroad branch] Statisticheskii uchet i analiz raboty otdeleniia dorogi. Moskva, Izd-vo "Transport," 1964. 218 p. (MIRA 17:5)

IVLIYEV, I.V.; PETRUKHNOVSKIY, I.V. retsenzent ; KRIMNUS, G.Kh. retsenzent ; NAUMOV, G.I. retsenzent ; ORLOV, V.N. retsenzent ; TUCHKEVICH, T.M. retsenzent ; USHAKOV, P.S. retsenzent ; CHERNUKHA, N.T. retsenzent ; EDEL'SHTEYN, P.G. retsenzent ; KRISHTAL', L.I., red.; VINNICHENKO, N.G., kand. ekon. nauk, red.; USENKO, L.A., tekhn.red.

[Finance and the financing of railroad transportation]Finansy i finansirovanie zheleznodorozhnogo transporta. Moskva, Transzheldorizdat, 1963. 439 p. (MIRA 17:2)

PETROKANSKIY, B.I.; ZVEREV, N.P., retsenzent; MIZIN, V.I., retsenzent; PETROV, A.I., retsenzent; KRISHTAL', L.I., red.; MURAV'YEVA, N.D., tekhn. red.

[Statistical accounting and the work analysis of a railroad division] Statisticheskii uchet i analiz raboty otdeleniia dorogi. Moskva, Izd-vo "Transport," 1964. 218 p. (MIRA 17:3)

YAKUBOV, L.S.; KRISHTAL', L.I.; DMITRIYEV, V.A.

[Principles of railroad statistics] Osnovy zheleznodorozhnoi statistiki. [Redaktory Krishtal', L.I., Dmitriev, V.A.] Moskva, Gos. transp. zhel-dor. izd-vo, 1953. 194 p. (MLRA 7:1)
(Railroads--Statistics)

LUGOVOY, P.A., inzh.; TSYPIN, L.G., inzh.; GIBSHMAN, A.Ye., prof., doktor tekhn. nauk, retsenzent; USHAKOV, S.S., doktor tekhn. nauk, retsenzent; KRISHTAL', L.I., red.; VOROTNIKOVA, L.F., tekhn. red.

[Technical and economic calculations in the reorganization of railroads] Tekhniko-ekonomicheskie raschety pri rekonstruktsii zheleznykh dorog. Moskva, Transzheldorizdat, 1963. 246 p. (MIRA 16:4)

(Railroad engineering)

KAPLAN, A.B.; NESTEROV, Ye.P., retsenzent; KRISHTAL', L.I., red.;
DROZDOVA, N.D., tekhn. red.

[Cybernetics in railroad transportation] Kibernetika na zheleznodorozhnom transporte. Moskva, Transzheldorizdat, 1963. 66 p. (MIRA 16:11)
(Railroads--Electronic equipment)
(Railroads--Management)

TISHCHENKO, Andrey Ignat'yevich; SAMOKHVALOV, V.A., retsenzent; KRISHTAL', L.I., red.; VOROTNIKOVA, L.F., tekhn. red.

[Technological reorganization of traction] Tekhnicheskaia rekonstruktsiia tiagi. Moskva, Transzheldorizdat, 1963. 131 p. (MIRA 16:7)

(Locomotives) (Railroads—Management)

ISTOMIN, L.I.; SHUBNIKOV, A.K.; POPOV, V.M.; MOLYARCHUK, V.S., retsenzent; PARSHIKOV, V.A., retsenzent; KRISHTAL', L.I., red.; KHITROV, P.A., tekhn. red.

[Linear programming in the planning of the fuel and electric-power supply for railroad transportation] Lineinoe programmirovanie v planirovanii toplivo- i energosnabzheniia zheleznodorozhnogo transporta. Moskva, Transzheldorizdat, 1963. 178 p. (MIRA 16:10)
(Linear programming) (Railroads--Management)

MIKHEYEV, A.P., doktor tekhn. nauk, prof., red.; KHISHTAL', L.I., red.

[Basic trends in the development of transportation technology in foreign countries] Osnovnye napravleniia v razvitii tekhniki transporta za rubezhom. Moskva, Transport, 1965. 335 p. (MIRA 18:4)

1. Moscow. Institut kompleksnykh transportnykh problem.

CA 9

Effect of silicon on the graphitization of cast iron. K. P. Bunin and M. A. Krishtal (Dnepropetrovsk Met. Inst.). *Dopovidi Akad. Nauk Ukrain. R.S.R.* 1950, 235-7.—A theoretical discussion. Murray Senkus

KRISHTAL, M. A.

KIRSHTAL, M. A.

USSR/Metals - Cast Iron, Processes Nov 51

"Concerning Graphitization of White Cast Iron,"
M. A, Kirshtal

"Litey Proizvod" No 11, pp 31, 32

Presents exptl evidence of shifting of iron atoms in process of decarburization of graphitized cast irons. Results obtained permitted study of effect of Si-content on rate of decarburizing process and detn of activation energy of this process. Considers graphitization as process reverse to decarburization of graphitized cast iron and explains accelerating effect of silicon on graphitization process.

198T86

KRISHTAL, M.A.

Theory of graphitization of white iron and steel. Lit.proizv. no.6:22-24 Je '53. (MLRA 6:7)

(Iron--Metallurgy) (Steel--Metallurgy)

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826510015-3"

USSR .

Determination of the diffusion coefficients of carbon in austenite and in ferrite. M. A. Krishtal. Zhur. Tekh. Fiz. 23, 1178-83(1953).—A new method is described for the detn. of diffusion coeffs. based on the decarbonization of Fe-C alloys. This method can be used on samples of ferrite and austenite. The values of the diffusion coeff. obtained by this method are quite precise.

Influence of cobalt on carbon diffusion in iron-carbon alloys. V. A. Yurkov and M. A. Krishtal. *Doklady Akad. Nauk S.S.S.R.* 92, 1171-3(1953).—Armco iron was melted in graphite crucibles, and the C content was held at 4.0%. The Co content was varied between 1 and 6%. Sheets 0.5 mm. thick were cast continuously, and were held at 950-1050° in pure H. The diffusion coeff. of C was detd. by the velocity with which an austenitic edge was formed. The curves show that sharp drops in the diffusion rate were observed at 1 and 4% Co. Measurement of elec. potentials of the alloys against Armco iron used for their prepn. in a 0.01 N H_2SO_4 showed two min., again at 1 and 4% Co. It appears that Co forms a stable at. grouping with localized electron bonds. Since the C diffusion process takes place in austenite, probably most of the Co is present in this phase, and not present as carbide. J. D. Gat

KRISHTAL, M.A.

USSR/ Engineering - Technical physics

Card 1/1 : Pub. 22 - 19/49

Authors : Krishtal, M. A.

Title : Fast graphitization of white cast-irons having a higher content of chromium

Periodical : Dok. AN SSSR 98/4, 583-584, Oct. 1, 1954

Abstract : A method which helps to speed-up the graphitization of white cast-iron (cast-iron with a high % of chromium) is described. Five references (1945-1953). Graph.

Institution : Arkhangelsk Forest Institute

Presented by : Academician G. V. Kurdyumov, April 24, 1954

USSR/Engineering - Technology

Card 1/1 Pub. 22 - 26/63

Authors : Krishtal, M.A.

Title : The nature of a process affecting the speed of cast iron graphitization

Periodical : Dok. AN SSSR 99/6, 983-986, Dec 21, 1954

Abstract : Experiments, intended to determine the nature of a process which reduces the speed of cast iron graphitization, are described. There are two concepts with regard to the speed of cast iron graphitization: one is based on the idea of carbon diffusion and of iron self-diffusion. The other is based on the idea of the speed of the removal of iron atoms from the cast iron as the graphite content grows. The experiments were conducted to determine which process is the more acceptable. Twelve USSR references (1949-1953). Graphs.

Institution: The Archangelsk Forest Technical Institute

Presented by: Academician A.N. Terenin, August 6, 1954

KRISHTAL, M. A.

Krishtal, M. A. -- "The Effect of Alloying Elements on the Kinetics and Mechanism of Graphitization of White Cast Iron." Min Higher Education USSR. Moscow Order of Labor Red Banner Inst of Steel imeni I. V. Stalin. Moscow, 1955. (Disseration For the Degree of Doctor in Technical Sciences).

So: Knizhnaya Letopis', No. 11, 1956, pp 103-114

KRISHTAL, M.A.

The graphitization theory. Lit.proizv. no.9:30-31 S'55.
(Cast iron--Metallurgy) (MIRA 8:12)

Method for determining the coefficient of self diffusion in iron in alloyed austenite. M. A. Krishtal. *Zhur. Tekh. Fiz.* 25, 144-6(1955).—Self diffusion in closely packed phases takes place by means of holes in the space lattice. A hole present in a crystal may be filled with an adjoining atom causing it to move for one interat. space. A displacement of a hole for a considerable distance does not require a corresponding movement of an atom. A motion of a no. of atoms each for one interat. space achieves the result. There is no need for an atom to travel from the surface into the body of metal for filling internal holes. Atoms of Fe diffuse in this manner, as can be seen in graphitization where holes must travel to graphite inclusions to permit C atoms to join the latter. Diffusion processes have the velocity the holes travel, and the decarburization reaction of 0.5-mm. plates of graphitic iron in H_2 was used for its demonstration. Measuring the thickness of austenitic layer free from graphite as a function of time gives this velocity. Specimens contg. 4.0% C and 0.6, 0.9, 1.2% Si and those with the same C and 1, 2.5, and 5% Ni were decarburized at 1050–950°, giving the speed of self diffusion of iron. At 1020° the diffusion velocities of the Si series were 8.1×10^{-6}, 1.05×10^{-6}, and 1.82×10^{-6}, while Ni increased it to 2.32, 9.23, and 14.0×10^{-6}. This diffusion velocity is about 4 orders of magnitude greater than that of pure iron. Diffusion data are tabulated.

J. D. Gat

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826510015-3"

Effect of tungsten on the kinetics of the process of [illegible]fization of white cast iron. M. A. [illegible]

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826510015-3"

AUTHOR: Krishtal, M.A., Eng. 129 - 8 -5/16

TITLE: Influence of preliminary hardening on the diffusion speed of carbon in the austenite. (Vliyaniye predvaritel'noy zakalki na skorost' diffuzii ugleroda v austenite).

PERIODICAL: "Metallovedeniye i Obrabotka Metallov"(Metallurgy and Metal Treatment), 1957, No.8, pp.20-21 (U.S.S.R.)

ABSTRACT: During heat treatment steel components may be subjected to repeated hardening and, therefore, it is of interest to study the influence of hardening on the speed of diffusion of carbon in the austenite. This was done by means of a metallographic method based on studying the speed of decarburisation of white iron described in earlier papers of the author (3,4). As test specimens the authors used 0.5 mm thick white iron plates containing 0.4% Cr and about 4% C; the material was produced by "liquid rolling" of melts smelted from commercially pure iron. The specimens were decarburised in a hydrogen stream at 850 C during one-and-a-half hours and as a result of this an 0.120 mm thick austenite layer was obtained with a carbon concentration approaching zero at the surface. The results are summarised in a table and a graph which gives the influence of the number of hardening operations on the value of the coefficient

Card 1/2

Influence of preliminary hardening on the diffusion speed of carbon in the austenite. (Cont.) 129 - 8 - 5/16

of diffusion of carbon in the austenite. It can be seen from this figure that with increasing number of hardening operations the diffusion of carbon in the austenite decreases. There are two figures, 1 table and 5 references, 4 of which are Slavic.

ASSOCIATION: Tulsk Mechanical Institute (Tul'skiy Mekhanicheskiy Institut).

AVAILABLE:

Card 2/2

AUTHOR: Krishtal, M. A. SOV/163-58-1-37/53

TITLE: On the Mechanism of the Diffusions in Volume Centered Iron (O mekhanizme diffuzii v ob"yemnotsentrirovannom zheleze)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 1, pp 201-205 (USSR)

ABSTRACT: Iron and many iron alloys have volume centered lattices and therefore are of great importance in the explanation of the mechanism of the diffusion in α- and δ-iron.
To explain the pore formation in volume centered iron samples were annealed at temperatures where δ-Fe occurs.
All samples investigated by metallographic analyses and microphotographs prove that none of the samples was without pores.
In microphotographs pores of uniform shape are present. The presence of pores in iron is proved by the diffusion of iron and tantalum in volume centered iron alloys. The shape of pores occurring most frequently is pentagonal.
By means of the microphotographs the depth of the penetration of the tantalum atoms into iron was determined. The mean magnitude of this penetration is 0,256 mm.

Ca[illegible]

SOV/163-58-1-37/53

On the Mechanism of the Diffusions in Volume Centered Iron

may be calculated by the following formula: $D = \frac{x^2}{4\tau}$, where x denotes the depth of penetration and τ the duration of the treatment of the sample at 1450°C.
The diffusion coefficient has the order of magnitude of 10^{-8}-10^{-9} cm^2/sec.
There are 5 figures, 1 table, and 6 references, 4 of which are Soviet.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: October 1, 1957

Card 2/2

KRISHTAL, M. A.,

AUTHOR: Krishtal, M.A., Candidate of Technical Sciences 128-58-5-10/16

TITLE: Calculating the Limiting Factor of the Graphitization Process (K raschëtu limitiruyushchego faktora protsessa grafitizatsii)

PERIODICAL: Liteynoye Proizvodstvo, 1958, Nr 5, pp 22-24 (USSR)

ABSTRACT: The author lists the different points of view on the factors limiting the graphitization process in malleable cast iron [Ref. 1 - 13] and analyzes the formulas suggested by different authors for determining the diameter of the growing graphite inclusions as a function of time, for determining the activation energy, etc. He comes to the conclusion that the speed of the initial graphitization process in Fe-C-Si alloys is controlled by the speed of the vacancies in austenite toward the growing graphite inclusions. He points out, however, that this conclusion can only be accepted as yet for the case of Fe-C-Si alloys of studied concentrations. In other cast irons, and particularly in alloyed cast irons, the graphitization process can be controlled also - as was already indicated - by the speed of the plastic flow of mold, by the diffusion of carbon, and by the solution of carbides.

Card 1/2

Calculating the Limiting Factor of the Graphitization Process 128-58-5-10/16

There are 13 references, 9 of which are Soviet and 4 English.

AVAILABLE: Library of Congress

Card 2/2

SOV-128-58-8-6/21

AUTHORS: Krishtal, M.A., Candidate of Technical Sciences, Fominykh, I.P., Candidate of Technical Sciences, Rikman, E.P., Engineer

TITLE: Peculiarities of Magnesium Distribution During Annealing of Magnesium-Treated Malleable Iron (Osobennosti raspredeleniya magniya pri otzhige magniyevogo kovkogo chuguna)

PERIODICAL: Liteynoye proizvodstvo, 1958, Nr 8, pp 10-11 (USSR)

ABSTRACT: The effect of magnesium on the formation of spheroidal graphite has been studied since the discovery of magnesium iron /Ref.1-7/. The purpose was to study the behaviour of manganese in the process of annealing, e.g. the redistribution of magnesium between the metal and the graphite. The study was carried out on specimens of iron of different composition and with the use of a device for localized spectrum analysis (described and illustrated by a diagram). It was stated that silicon, solved in metal, ties magnesium, and hence an increased silicon content in iron entails an increased solubility of the manganese therein. The bond between the atoms of silicon and magnesium impedes the transfer of magnesium from the matrix (austenite) into the graphite during the process of annealing. In low-silicon iron,

Card 1/2

SOV-128-58-8-6/21

Peculiarities of Magnesium Distribution During Annealing of Magnesium-Treated Malleable Iron

the magnesium atoms in the matrix are only weakly bound, and migrate into the graphite even at comparatively low temperatures. There are 2 graphs, 1 diagram, and 7 references, 5 of which are Soviet, 1 English and 1 German.

1. Iron alloys--Heat treatment 2. Magnesium--Metallurgical effects

Card 2/2

PHASE I BOOK EXPLOITATION SOV/3790

Tula. Mekhanicheskiy institut

Vliyaniye obrabotki na strukturu i svoystva metallov; sbornik statey. (The Effect of Machining on the Structure and Properties of Metals; Collection of Articles), Moscow, Oborongiz, 1959. 76 p. (Series: Its: Trudy, vyp. 11) No. of copies printed not given.

Ed.: M.A. Krishtal, Candidate of Technical Sciences, Docent. Ed. of Publishing House: S.I. Vinogradskaya. Tech. Ed.: V.I. Oreshkina. Editorial Board: G.S. Petrukhin (Chairman) and Resp. Ed. of Series, Director of the Institute, Candidate of Technical Sciences, Docent; A.G. Gerst, Doctor of Chemical Sciences, Professor; A.I. Lempel, Doctor of Technical Sciences, Professor (deceased); M.A. Bumartsev, Doctor of Technical Sciences, Professor; A.N. Ter-Mkrtich'yan, Candidate of Technical Sciences, Docent; V.D. Bochkovskiy, Candidate of Physics and Mathematics, Docent; B.S. Salamartsev, Candidate of Economic Sciences, Docent; A.Ya. Khaydenko, Candidate of Technical Sciences, Docent (Scientific Secretary)

PURPOSE: This collection of articles is intended for scientific and technical personnel in the metalworking industry.

COVERAGE: The articles were prepared by members of the Department of Physical Metallurgy, Tula Mechanical Institute, in conjunction with members of other departments and industrial personnel. The book deals with the effect of various conditions of heat treatment and mechanical treatment (shot peening and coining) on the structure and properties of ferrous metals. Proper conditions are indicated for annealing malleable iron and extending the life of machine parts under cyclic-impact loads. New data are given on working-out a method of internal burnishing with the use of mandrels. In addition, results of an investigation of the distribution of elements in alloys are presented. References, chiefly Soviet, accompany individual articles. No personalities are mentioned.

Mirkin, I.L., and T.A. Sirenko, [Engineer]. Investigation of the Surface Layer of Steel Formed by Internal Burnishing 32

This and the following article deal with the mechanical properties of the surface layer obtained under various conditions of burnishing. Extent of plastic deformation is determined, and diagrams of residual stresses along the cross section of specimens treated with mandrels are constructed. The effects of magnitude of interference and of the material of the mandrel are discussed.

Mirkin, I.L., and T.A. Sirenko. Investigation of the Effect of Microstructure and Process Parameters on the Condition of the Surface Layer of Burnished Holes in Steel 46

Krishtal, M.A. [Candidate of Technical Sciences, Docent], I.P. Fominykh [Candidate of Technical Sciences, Docent], B.V. Bobrov [Candidate of Technical Sciences, Docent], and A.Ya. Tseytlin [Engineer]. Peculiarities in Surface Structure as a Factor in the Machinability of Decarburized Malleable-Iron Castings 66

The authors discuss a specific surface defect in ferritic malleable-iron fittings and sheets, the presence of which impairs machinability. The nature of defects of this type is clarified, and methods of annealing so as to preclude defects are indicated.

AVAILABLE: Library of Congress (TN1.T5)

VK/mas
6-17-60

18 (7)

AUTHORS: Krishtal, M. A., Golovin, S. A.

SOV/163-59-2-30/48

TITLE: The Relative Fading of Torsional Oscillations in the Thermally Treated Steels 50A and U7A (Otnositel'noye zatukhaniye krutil'nykh kolebaniy v termicheski obrabotannykh stalyakh 50A i U7A)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1959, Nr 2, pp 173-175 (USSR)

ABSTRACT: The authors investigate the internal microplastic friction in the hardened and drawn steels mentioned in the title in order to clarify the connection between metal structure and internal friction in carbon steels. Products of these sorts of steel (springs) are exposed to rapidly changing loads. The composition of the two steel types is indicated in a table. The internal microplastic friction was determined by the fading of the free torsional oscillations which were recorded by a special apparatus with tensometric recording of the vibrogram. The results for the two steel types are represented in figures 1 and 2. They show the dependence of the torsional oscillations on the voltage applied to the periphery of the sample. Figures 3 and 4 show the influence of various drawing temperatures.

Card 1/2

The Relative Fading of Torsional Oscillations in the Thermally Treated Steels 50A and U7A SOV/163-59-2-30/48

At drawing temperatures between 450 and 550°, a considerable reduction of fading occurs. It is explained by a splintering of the blocks of the α-phase in drawing, as was also ascertained in the investigations by K. F. Starodubov and A. A. Sazonova (footnote on p 174). The fading of the oscillations in hardened steel drawn at a low temperature is mainly influenced by the austenite component whereas at drawing temperatures above 300° the ferrite structure becomes decisive. There are 4 figures, 1 table, and 2 Soviet references.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Institute of Mechanics)

Card 2/2

18(3) SOV/128-59-7-14/25

AUTHOR: Krishtal, M.A., Candidate of Technical Sciences

TITLE: Neutralizing Chromium in Malleable Iron

PERIODICAL: Liteynoye Proizvodstvo, 1959, Nr 7, pp 34-35 (USSR)

ABSTRACT: As is well known chromium - even in small amounts - blocks the process of graphite formation. Science is occupied with the acceleration of this process and the author himself has already written several articles on the influence of cobalt, bismuth, etc. on the formation of new groupings of atoms. Therefore, the author has done experiments to neutralize the chromium during the production of cast iron in order to allow the formation of graphite. As a basic material cast iron with a contents of chromium of 0,28% has been used. An exactly measured amount of antimony (Sb) has been admixed to have an exact knowledge of the proportion of the atoms (N_{sb} : N_{cr}). The results of the research on the formation of graphite are lis-

Card 1/2

SOV/123-59-7-14/25

Neutralizing Chromium in Malleable Iron

ted in one table. The formation of graphite appears as a function of the contents of antimony. The process of graphite formation lasts 6 to 7 times longer in case antimony has not been added. The foundry experiments and the analysis had been made with the assistance of B.A. Lyzlov. The experiments have shown that the most favorable proportion of N_{sb} : N_{cr} is equal to a ratio of 2 : 3. There are 2 diagrams, 2 microphotographs and 11 Soviet references

Card 2/2

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AUTHOR: Krishtal, M. A. SOV/126-7-3-37/44

TITLE: Estimation of the Vacancy Concentration in Gamma-Iron by the Internal Friction Method (Otsenka kontsentratsii vakansiy v gamma-zheleze metodom vnutrennego treniya)

1959

PERIODICAL: Fizika metallov i metallovedeniye, Vol 7, Nr 3, pp 469-470 (USSR)

ABSTRACT: Slightly Abridged Translation.

The peaks of internal friction at low temperatures in interstitial body-centred cubic solid solutions are associated with diffusion redistribution of the dissolved atoms under the action of applied forces (Ref.1). Carbon atoms dissolved in alpha-iron are in the octahedral pores of the lattice and create distortions which change the tetragonal symmetry. In the absence of stress the distortion axes are evenly distributed between the three directions [100], [010] and [001]. The force applied along one of these directions leads to such a redistribution of atoms that the axes of tetragonal distortions lie along the line of action of the force, since stresses are partly removed. The change of

Card 1/4

SOV/126-7-3-27/44

Estimation of the Vacancy Concentration in Gamma-Iron by the Internal Friction Method

deformation lags behind the change in stress, which leads to internal friction. The atoms of carbon in the vacancies do not lead to tetrahedral distortions and can give internal friction peaks only if their concentration is great. If the carbon concentration is low, peaks are absent. Therefore it appeared probable that a super-saturation of iron with vacancies would lead to a lowering of internal friction peaks. A calculation of the concentration of the carbon which had gone to the vacancies will enable the vacancy concentration in the specimen to be estimated.

The number of vacancies in metals increases with rise in temperature. An investigation was carried out with wire specimens of Armco iron, 0.5 mm diameter and 320 mm long, which had been quenched from 1250 and 1370°C (i.e. from the gamma-region). Heating was carried out in quartz ampoules of small diameter which had been evacuated to a pressure of 10^{-5} mm Hg. Quenching was carried out together with the ampoule in cold water. The metal contained 0.013% C, 0.02% Mn, 0.008% P, 0.023% S and traces of Si.

Card 2/4

67730
SOV/126-7-3-37/44

Estimation of the Vacancy Concentration in Gamma-Iron by the Internal Friction Method

It was assumed that the vacancies formed on heating are filled by carbon atoms. Specimens were soaked at 1250 and 1370°C for 40 minutes each. There will be insufficient time for the vacancies forming in quenching during the $\gamma \rightarrow \alpha$ transformation to be filled by carbon atoms, as it takes only about one second. It appears probable that the vacancies formed at a high temperature will be "marked" by carbon atoms.

The results of internal friction measurement with a torsion pendulum at an oscillation frequency of 1.35 cycles per second are shown in Fig.1. The curve for unquenched Armco iron of the same composition, taken from the work of Pao-tsuy Yun' et alia (Ref.2), is also shown. The internal friction peaks become lower as the quenching temperature is increased.

In the table on p 470 results of treatment of experimental data regarding the exposure of carbon in solution and that having gone into the vacancies, are shown on the basis of data

Card 3/4

4

SOV/126-7-3-37/44

Estimation of the Vacancy Concentration in Gamma-Iron by the Internal Friction Method

by P'ao-ts'ui Yün et alii (Ref.2) and Dijkstra et alii (Ref.3).

The vacancy concentrations obtained are comparable with data by Lazarev et alii (Ref.4) in which it is shown that other face-centred cubic metals, e.g. gold and platinum, at the melting temperature have 0.1 at.% vacancies.

There is 1 figure, 1 table and 4 references, of which 3 are Soviet and 1 English.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: February 28, 1958

Card 4/4

SOV/126-7-4-11/26

AUTHOR: Krishtal, M.A.

TITLE: On the Volume and Grain Boundary Diffusion

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 4, pp 565-571 (USSR)

ABSTRACT: After discussing the fact that the relative importance of the part played by the volume and grain-boundary diffusion often depends on the thermal history of the metal or alloy under consideration and that, according to some workers (Ref 6-8) the ratio between the coefficients of the volume and grain-boundary diffusion is often of the order of 10^3 to 10^5, the author points out that in some published papers the values of the calculated diffusion coefficients are regarded as referring to one or the other type of diffusion without first evaluating the coefficient of the grain-boundary diffusion and without sufficient experimental evidence. Thus, a subjective factor is introduced in deciding whether the diffusion process is of the volume, grain-boundary or mixed type, the more so that in most cases the diffusion coefficients are calculated from one and the same formula (Equation 1). The object of the work reported

Card 1/6

in the present paper was to calculate the diffusion parameters Q and A from experimental data using equations derived for the case of volume diffusion alone, compare the obtained results with the values of Q and A calculated with the aid of Eq (1) and use the obtained data for evaluating the part played of the two types of diffusion in various processes. Experimental data on the coefficients of self-diffusion in silver and iron, and coefficients of diffusion in iron quoted by various workers (Ref 3, 8-11), were used in these calculations carried out with the aid of the Dushman-Langmuir equation

$$D = \frac{\delta^2}{Nh} Qe^{-Q/RT} \qquad (2)$$

where δ - interatomic distance; N - Avogardo number; h - Planck constant; Q - activation energy of diffusion; R - gas constant; T - absolute temperature. Eq (2) was selected since it is in good agreement with the experimental data on self-diffusion in tin, gold and copper (Ref 13). The pre-exponential term of this equation contains well-known magnitudes (δ, N, h) which does not always apply to other formulae describing the connection between diffusion parameters (Ref 14,15). The value of δ was taken to be equal to the shorter interatomic distance (2.883 Å for silver, 2.52Å for iron). Table 1 gives the experimental data on the self-diffusion in silver (first 3 lines) and iron (the next 3 lines) and on diffusion of chromium in iron (last 2 lines), represented in the form of parameters Q (kcal/g-atom) and A (cm^2/sec) of Eq (1). (Column 4 gives the reference, column 5 the type of diffusion according to the original source: volume, mixed, grain boundary, volume, volume, grain boundary, volume, volume, mixed). The calculations of the value of activation energy from Eq (2) were carried out by the section method (Ref 16). Fig 1a and b show the examples of the results on these calculations for volume self-diffusion in silver and mixed self-diffusion in silver, respectively. The values of the coefficients of diffusion and self-diffusion and the values of Q and A calculated from Eq (2), are given in Tables 2, 3, 4 and 5. The values of the diffusion coefficients D (cm^2/sec) and parameters Q and A calculated from Eq (2) for self-diffusion in silver are given in Table 2, the three sets of data referring to volume, grain boundary and mixed diffusion. The same data for self-diffusion in iron are given in Table 3 for the cases of volume and grain boundary diffusion. Table 4 gives the values of D, A and Q for self-diffusion in silver for the case of volume diffusion only but calculated from data quoted in Ref 9 and Ref 10. The same data for volume and mixed diffusion of chromium in iron are given in Table 5. Fig 2 shows the temperature dependence of the values of Q calculated from Eq (2) for: 1 - volume; 2 - mixed; 3 - grain boundary diffusion in silver; 4, 5,7 - volume self-diffusion in iron according to data published in Ref 8, 9 and 11; 6 - grain boundary diffusion in iron; 8,9 - volume and mixed diffusion of chromium in iron. The values of Q at 300°C obtained by extrapolation of curves in Fig 2 are given in Table 6 (column 3) together with values of Q calculated from Eq (1) (column 2); column 1 of this table gives the character of diffusion (self-diffusion in silver, self-diffusion in iron and diffusion of

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000826510015-3"

chromium in iron); column 4 gives the source of the experimental data; column 6 gives the type of diffusion: volume, mixed, grain boundary, volume, volume, grain boundary, volume, volume, mixed. Several conclusions can be drawn from the results obtained by the present author; (1) When Equations (1) and (2) are used for calculating the parameter A, comparable values are obtained in the case of volume self-diffusion only. (2) In the case of volume diffusion, the values of activation energy calculated from Eq (2) decrease with rising temperature. (3) There is a linear relationship between the temperature and the values of activation energy calculated from Eq (2). (4) Extrapolation of activation energy curves determined with the aid of Eq (2) gives the values of Q at 300°K comparable with those obtained from Eq (1) in the case of volume diffusion and self-diffusion only. Extrapolation of these curves below 300°K shows that in the case of grain-boundary and mixed diffusion in iron and grain-boundary self-diffusion in silver, there are temperatures at which both values of Q coincide. The results of

SOV/126-7-4-11/26

On the Volume and Grain Boundary Diffusion

calculations of these values are given in Table 7 under the following headings: number of the curve in Fig 2; equation of the curve; character of diffusion (self-diffusion in silver, self-diffusion in iron, diffusion of chromium in iron); the temperature (°K) at which $Q_2 = Q_1$; type of diffusion (grain-boundary, grain-boundary, mixed). (5) Calculated values of A and Q corresponding most closely to those characteristic of the volume diffusion were obtained from experimental data due to Gruzin (Ref 9) and Birchanall and Mehl (Ref 11). There are 2 figures, 7 tables and 16 references, 11 of which are Soviet, 4 English and 1 German.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: November 20, 1957

Card 6/6

SOV/126-8-2-20/26

AUTHORS: Krishtal, M.A. and Golovin, S.A.

TITLE: Nature of Internal Friction in Hardened and Tempered Steel

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 294 - 301 (USSR)

ABSTRACT: Many hardened and tempered steel parts work under loads of variable sign at high temperatures and the nature of relaxation effects is thus impartial. A pronounced internal-friction peak has been observed (I.N. Chernikov - Refs 1, 2) for hardened and tempered carbon steels at 200 °C, the peak height depending on the carbon content and tempering temperature. The authors describe their work with type V-1 high-carbon steel, widely used for springs. Two compositions (Table 1) were used: 0.71, 0.92% C; 0.47, 0.24% Mn; 0.34-0.26% Si, respectively, with 0.02% S, 0.03% P, traces of Cr, under 0.1% Cu and no Ni nor Ti. Test pieces were 0.8 mm in diameter, 320 mm long. Vacuum annealing at 1 000 °C for two hours was carried out before hardening; hardening was from 800 °C. Tempering

Card1/4

SOV/126-8-2-20/26

Nature of Internal Friction in Hardened and Tempered Steel

was effected for one hour at temperatures of 100, 200, 250, 350, 450, 500 and 700 °C. Internal friction was measured on a type RKF-MIS-1 vacuum torsional installation at frequencies of 1.33 and 2.08 c.p.s. Internal friction as functions of temperature for various tempering temperatures is given in Figures 1 and 2 for the 0.71 and 0.92% C specimens. The peaks lie between 220 - 260 °C, decreasing in value with rising tempering temperature and with falling carbon content (as shown by the data in Table 2, derived from the authors' and published (Ref 1) data and in Figure 3). The temperature of the peak rises linearly with increased carbon content (Figure 4). In Figure 5, the internal friction peak values are shown to be related linearly both to total carbon percentage and to percentage of residual austenite (obtained from the work of A.P. Gulyayev - Ref 4). The authors have calculated values of the diffusion coefficient and activation energy corresponding to the positions of internal-friction peaks. For activation-energy determinations additional internal-friction measurements were

Card2/4

SOV/126-8-2-20/26

Nature of Internal Friction in Hardened and Tempered Steel

carried out at 2.08 c.p.s. Figures 6 and 7 show internal friction plotted against temperature for the 0.71 and 0.92% C steels, respectively, hardened from 800 °C. Curves 1 and 2 in Figure 6 correspond to frequencies of 1.33 and 1.81 c.p.s. and to frequencies of 1.33 and 2.08 in Figure 7, a second pair of curves in the latter corresponding to steel tempered at 250 °C. Tables 3, 4, and 6 show diffusion-coefficient values for carbon in the 0.92- and 0.71%-C carbon steels, respectively; Tables 5 and 6, based on published (Ref 1) data, give the values for steels with 0.58 and 0.46% C, respectively. The results agree with published (Ref 8) indications that the rate of diffusion of carbon is less in austenite subjected to hardening than in austenite not so treated. Diffusion-coefficient values measured by the internal-friction method for hardened steel tempered at low temperatures agree with those found metallographically in austenite obtained from the hardened state. As a further

Card3/4

SOV/126-8-2-20/26

Nature of Internal Friction in Hardened and Tempered Steel

check the internal friction of 0.92% C steel subjected to double hardening from 800 °C was determined, showing a displacement of the internal-friction peak towards higher temperatures (Figure 8 - Curve 2 compared with Curve 1).

Professor B.N. Finkel'shteyn, Yu.V. Piguzov, L.F. Usova and I.N. Chernikova helped in internal-friction measurements. There are 8 figures, 7 tables and 10 references, of which 8 are Soviet, 1 English and 1 international.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: February 28, 1958

Card 4/4

SOV/126-8-2-21/26

AUTHORS: Krishtal, M.A. and Golovin, S.A.

TITLE: Contribution on the Nature of Relative Damping of Oscillation in Hardened and Low-tempered Carbon Steel

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 302 - 308 (USSR)

ABSTRACT: The authors' previous (Refs 1, 2) measurements of micro-plastic internal friction in heat-treated type 50A and U7A steels and of internal-friction relaxation in U7A and U9A steels showed the great effect of residual austenite in hardened and low-tempered specimens on the damping capacity of the steel. Their present investigation, aimed at further examination of this postulate, was carried out with 50A and U7A steels (widely used for machine parts subjected to vibration in service) of the following respective percentage composition: 0.49, 0.70 C: 0.34, 0.23 Mn; 0.54, 0.18 Si; 0.024, 0.021 S; 0.019, 0.026 P; 0.19, traces Cr. An apparatus (Figure 1) was provided with tensometric recording of vibration patterns and with a furnace

Card1/3

SOV/126-8-2-21/26

Contribution on the Nature of Relative Damping of Oscillation in Hardened and Low-tempered Carbon Steel

enabling the 7-mm diameter test pieces to operate at up to 360 °C with 10° intervals in a protective atmosphere. Before hardening (from 800 °C for U7A and from 860 °C for 50A steel) specimens were annealed for one hour; hardening was followed by tempering for one hour at different temperatures. The effect of repeated-stressing treatment on relative damping for the two steels is shown in Figures 2 and 3. In the higher-carbon steel repeated-stress treatment gave reduced relative damping at higher stresses. The treatment did not increase hardness. Holding in liquid nitrogen was found to reduce relative damping for tempering temperatures up to 200 °C (Figures 4 and 5 show this property as a function of stress for various heat-treatment histories for the two steels). Repeated hardening also reduced relative damping (Curve 2 compared with Curve 1 in Figure 6). A maximum of relative damping was found for U7A steel at about 290 °C in tests with continuous heating (Figure 7). The authors used their own and published (Ref 1) data to calculate the carbon

Card2/3

SOV/126-8-2-21/26

Contribution on the Nature of Relative Damping of Oscillation in Hardened and Low-tempered Carbon Steel

diffusion coefficient; diffusional relaxation in austenite evidently plays some part. Their results indicate that residual austenite has a considerable influence on the damping properties of the hardened and low-tempered steels investigated (Figure 8 shows relative damping at various stresses plotted against time of tempering at 200 °C for U7A steel). There are 8 figures, 1 table and 9 references, 7 of which are Soviet and 2 English.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: August 22, 1958

Card 3/3

KRISHTAL, M.A., kand. tekhn. nauk, dots.; FOMINYKH, I.P., kand. tekhn. nauk, dots.; BOBROV, V.F., kand. tekhn. nauk, dots.; TSEYTLIN, A.Ya., inzh.

Characteristics of the surface structure of decarburized malleable iron castings and their machinability. Trudy TMI no.11:66-77 '59. (MIRA 12:12)

(Cast iron--Heat treatment) (Metal cutting)

KRISHTAL, M. A., Dr. Tech Sci -- (diss) "Diffusion process in steel alloys," Moscow, 1960, 51 pp (Moscow Steel Institute im I. V. Stalin) (KL, 33-60, 144)

PHASE I BOOK EXPLOITATION SOV/5303

Nauchno-tekhnicheskoye soveshchaniye po dempfirovaniyu kolebaniy. Kiyev, 1958.

Trudy Nauchno-tekhnicheskogo soveshchaniya po dempfirovaniyu kolebaniy, 17 - 19 dekabrya 1958 g. (Transactions of the Scientific and Technical Conference on the Damping of Vibrations, Held 17 - 19 December, 1958) Kiyev, Izd-vo AN UkrSSR, 1960. 178 p. 2,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut metallokeramiki i spetsial'nykh splavov.

Editorial Board: I. N. Frantsevich, G. S. Pisarenko (Resp. Ed.), G. V. Samsonov, V. V. Grigor'yeva, and A. P. Yakovlev; Ed. of Publishing House: I. V. Kisina; Tech. Ed.: A. A. Matveychuk.

COVERAGE: The book contains 27 articles dealing with principal results of theoretical and experimental investigations of energy dissipation in mechanical vibrations carried out in the Soviet Union from 1956 to 1958. Problems of energy dissipation in materials and factors affecting it are discussed. Purportedly new methods of experimental investigation of damping of vibrations are presented. Attention is given to the recently developed nonlinear theory of calculating vibrations in elastic systems, taking energy dissipation into account. Attempts to analyze internal energy dissipation in materials using methods of mathematical statistics are discussed. Some articles deal with engineering problems in dynamics, in which damping is claimed to play a highly substantial part. Aspirant N. I. Mukhin, of the Kiyev Polytechnic Institute, is mentioned. References accompany some of the articles.

TABLE OF CONTENTS:

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PHASE I BOOK EXPLOITATION SOV/5305

Moscow. Institut stali

Relaksatsionnyye yavleniya v metallakh i splavakh; trudy Mezhvuzovskogo soveshchaniya (Relaxation Phenomena in Metals and Alloys; Transactions of the Inter-Institute Conference) Moscow, Metallurgizdat, 1960. 325 p.

Sponsoring Agency: Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya RSFSR and Moskovskiy institut stali imeni I.V. Stalina.

Ed. (Title page): B.N. Finkel'shteyn; Ed. of Publishing House: Ye.I. Levit; Tech. Ed.: A.I. Karasev.

PURPOSE: This collection of articles is intended for personnel in scientific institutions and schools of higher education and for physical metallurgists and physicists specializing in metals. It may also be useful to students of these fields.

COVERAGE: The collection contains results of experimental and theoretical investigations carried out by schools of higher education and scientific research institutions in the field of the relaxation phenomena in metals and alloys. Several articles are devoted to the investigation—by the internal-friction method—of the decomposition of supersaturated solid solutions. Also analyzed are the defects of the crystalline lattice, plastic deformations, high-temperature behavior of alloys, and creep. Problems of the relation between internal friction and temper brittleness, the use of the method of internal friction in the investigation of powder-metallurgy products, and the mechanism of impact fatigue are discussed. The collection also contains articles on the damping characteristics of materials, elastic after-effect, and the new slow-detection method. No personalities are mentioned. References follow most articles. There are 366 references: 192 Soviet and 174 non-Soviet.

2/

S/128/60/000/009/001/003
A161/A133

AUTHORS: Krishtal, M. A., and Titenskiy, E. G.

TITLE: Modified malleable cast iron with high chrome content

PERIODICAL: Liteynoye proizvodstvo, no. 9, 1960, 33-35

TEXT: As it is known, chrome is the strongest inhibitor of the graphitization process in malleable cast iron, and its usually permissible maximum content is 0.07%. More chrome is getting into cast iron with high-alloy steel scrap, and ways must be found to neutralize its effect. This is possible by the addition of silicon and aluminum [Sobolev, B. F. - Ref. 2: Modifitsirovaniye i isskustvennoye stareniye kovkogo chuguna (Modification and artificial aging of malleable cast iron), Mashgiz, 1956], or by the addition of manganese. But the greatest attention is paid now to the addition of antimony (Krishtal, M. A. - Ref. 3: DAN SSSR, v. 99, no. 4, 1954; Livshits, B. G. - Ref. 4: DAN SSSR, v. 93, No. 6, 1953; Krishtal, M. A. - Ref. 5: Liteynoye proizvodstvo, no. 8, 1959). This article presents data obtained in an investigation with additions of antimony and boron, and combinations of boron with bismuth, and boron with antimony. Boron was added in the form of

Modified malleable cast iron with...

S/128/60/000/009/001/003
A161/A133

ferrosiliconboral and ferroboron in amounts of 0.003 - 0.010% of the weight of iron. Antimony and bismuth were used in metallic form. The Gor'kovskiy avtozavod (Gor'kiy Automobile Plant) has started to utilize cast iron modified with boron and bismuth, but the mechanism of the effect of these additives on the graphitization is not yet clear and further experiments are necessary. Four alloy groups were studied (the compositions are given in the table). The results prove that the graphitization time is shortest at a weight per cent ratio of antimony and chrome of 3:2, which corresponds to the formation of atomic segregations of the Sb_2Cr_3 type. Annealing for 36 hours as illustrated in diagram (Fig. 1) resulted in malleable cast iron with granular pearlite metal (Fig. 2,a); no primary carbides formed with a chrome content of up to 0.2%. The mechanical properties of metal modified by Sb alone are given in curves (Fig. 3): hardness and strength increasing with a rising Cr-content, the plasticity decreases; at 0.1% Cr the elongation is 5%, at 0.2% Cr it is 2.6%; the ultimate strength and hardness increase to 50 kg/mm^2 and HB235; the machinability remains good despite high hardness. Contrary to Sb only, additions of B and Bi resulted in 5 - 8% eutectic carbides even at a low Cr-content (0.06%) and mechanical properties as in Figure 4. The residual carbides did not affect the machinability because of the en-

Card 2/5

S/128/60/000/009/001/003
A161/A133

Modified malleable cast iron with...

veloping graphite, and at up to 0.20% the elongation did not drop below 6%, the strength reached 40 - 42 kg/mm^2, and hardness HB157. An increase in the chrome content over 0.10% resulted in some decrease of the impact strength. This modification method yielded ferritic high-chrome iron with low hardness and high elongation. Iron modified with boron only had a sufficiently high graphitization capacity. Bismuth is a very inconvenient additive - it burns with copious fumes separation. Antimony is a chemical equivalent of bismuth, and it has the same chilling effect and dissolves well in iron, whilst liquid iron and bismuth do not mix at all. The plasticity of iron modified with B and Sb remains high with up to 0.2% Cr, and the elongation is about 7%; the strength and hardness are increasing with a rising Cr-content. The higher hardness is due to the presence of a small quantity of pearlite (Sb prevents graphitization in the second stage). The machinability is not affected by residual pearlite. In general, the machinability of iron modified with boron and antimony, or with boron and bismuth is practically same. Antimony (like bismuth) gives an isotropic iron structure. Modification with antimony is not accompanied with any fumes separation. Boron alone may be used for thin-walled castings (5 - 15 mm), for no graphite separation takes place during crystallization. The optimum boron addition for 15 mm wall castings is

Card 3/5

S/128/60/000/009/001/003
A161/A133

Modified malleable cast iron with...

0.003 - 0.005%. The impact strength of iron modified with boron only drops abruptly with an increasing chrome content, which appears to be due to anisotropy but it does not affect the other mechanical properties. The machinability of boron-modified iron did not differ from the usual in malleable iron or in iron modified with other additives. There are 6 figures and 8 Soviet-bloc references.

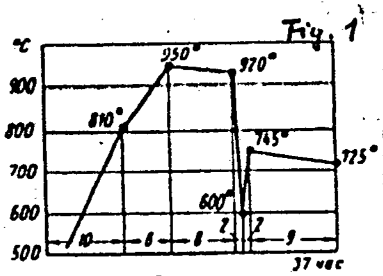

Figure 1:

The annealing graph: temperature in °C and time in hours (to 37 hours).

Card 4/5

Груп-па	Чугуны	1) Химический состав в %							2) Добавка модификаторов в %		
		C	Si	Mn	S	P	Cr	Al	Sb	B	Bi
I	Модифицированные сурьмой . .	2,72–2,82	1,14–1,27	0,50–0,65	0,126–0,132	0,074	0,70–0,20	0,015–0,020	0,12–0,30	–	–
II	Модифицированные бором и висмутом	2,50–2,85	1,16–1,22	0,53–0,58	0,12–0,140	0,082	0,07–0,16	0,015–0,020	–	0,003–0,005	0,01
III	Модифицированные бором . . .	2,61–2,72	1,12–1,23	0,47–0,53	0,10–0,143	0,070	0,05–0,16	0,015–0,020	–	0,003–0,01	–
IV	Модифицированные бором и сурьмой	2,67–2,79	1,16–1,30	0,49–0,53	0,120–0,136	0,072	0,07–0,20	0,015–0,.20	0,003–0,001	0,003–0,005	–

Table: I - Iron modified with Sb; II - with B and Bi; III - with B only; IV - with B and Sb.
(1) chemical composition in %;
(2) addition of modifiers in %.

Card 5/5

S/126/60/009/02/033/033
E111/E335

AUTHOR: Krishtal, M.A.

TITLE: Special Features of the Influence of Silicon on the Diffusion of Carbon in Austenite

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 2, pp 317 - 319 (USSR)

ABSTRACT: The author notes that the results of his metallographic investigation of the influence of silicon on the kinetics of carbon diffusion in iron-carbon alloys (Ref 3) differ from those of others (Refs 1, 2); this has led to confusion (Ref 4). He has now added precision to his previous results and extended his measurements to higher temperatures. Using his previous method (Ref 3) he has studied diffusion during annealing at 860, 880, 920, 950, 1 000, 1 050 and 1 100 °C. The data in Table 1 show that at 1 100 deg an increase in the silicon content reduces the diffusion coefficient; at 1 000 and 1 050 °C it has little effect and at 950 °C and below it increases diffusion.

Card 1/2

S/126/60/009/02/033/033
E111/E335

Special Features of the Influence of Silicon on the Diffusion of Carbon in Austenite

There are 2 tables and 8 references, 6 of which are Soviet and 2 English.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: December 3, 1959

Card 2/2

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S/126/60/009/05/006/025
E111/E335

AUTHOR: Krishtal, M.A.

TITLE: Diffusion of Several Elements from One Source in Iron and its Alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 5, pp 680 - 688 (USSR)

ABSTRACT: The object of this work was to develop the method for investigating the diffusion of several elements from a single source and make a qualitative evaluation of the influence of some alloying elements. The localized spectrum-analysis method of I.L. Mirkin and E.P. Rikman (Ref 1) was used, giving a diameter for the working part of the sparked area as low as 0.05 mm, or the spark operates between the section and an edge up to 0.1 mm thick. The source was electrolytic iron alloyed with 0.012% C, 0.023% P, 0.014% S and 2.5% each of Cr, Mn, Si, Mo and Ti. Diffusion was studied into iron and also into binary alloys with 5 at % of Cr, Si, Co and V. Figure 1 shows distribution of chromium, silicon and vanadium with depth in diffusion layers of specimens made up of iron-silicon, iron-chromium and iron-vanadium alloys and electrolytic iron. The

Card1/3

80527
S/126/60/009/05/006/025
E111/E335

Diffusion of Several Elements from One Source in Iron and its Alloys

ordinates in this and all other figures in the paper show the difference between the degrees of darkening of the analytical pair of spectrum lines. Figure 2 shows distributions of chromium, silicon and vanadium in a single ferrite grain for diffusion from the multi-component source. Figure 3 shows distributions of titanium, manganese, silicon, chromium and molybdenum diffusing from the complex alloy (lefthand figures in abscissae) into iron; the corresponding curves for diffusion into the binary iron-chromium alloy are shown in Figure 4, into the binary iron-silicon alloy in Figure 5, into the binary iron-vanadium alloy in Figure 6 (which includes a curve for vanadium) and into the binary iron-cobalt alloy in Figure 7. Figure 8 gives the titanium-distribution curves for diffusion into all the binary alloys and iron; Figures 9, 10 and 11 give the corresponding curves for manganese, chromium and silicon. From these figures the influence of each alloying element on the diffusion of each element can be estimated: the author gives values on this influence. The work showed that the rate of diffusion increases in the following order:

Card2/3

20527

S/126/60/009/05/006/025
E111/E335

Diffusion of Several Elements from One Source in Iron and its Alloys

titanium, manganese, chromium, silicon and molybdenum. All the alloying elements of the binary alloys reduce the diffusion rate, this effect being the more marked the slower the diffusion rate of the diffusing element in iron. Cobalt had the greatest effect on diffusion, which the author attributes to its pronounced effect in reducing isothermal austenite decomposition in the presence of other elements. Professor I.L. Mirkin assisted in discussion of results and E.P. Rikman and N.I. Peshkova in the experimental work. There are 11 figures and 4 Soviet references.

ASSOCIATION: Tul'skiy mekhanicheskiy institut (Tula Mechanical Institute)

SUBMITTED: October 16, 1959

Card 3/3

KRISHTAL, M.A.; RIKMAN, E.P.

Distribution of elements in a complex iron-base alloy. Fiz. met. i metalloved. 9 no.5:790-792 My '60. (MIRA 14:4)

1. Tul'skiy mekhanicheskiy institut.
(Iron alloys--Metallography)

Krishtal, M.A.

S/126/60/010/02/015/020
E021/E335

AUTHORS: Piguzov, Yu.V., Krishtal, M.A. and Golovin, S.A.

TITLE: The Nature of the Maximum of Internal Friction in Steel After Thermal Treatment

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10, No. 2, pp 285 - 290

TEXT: Experiments were carried out on three steels - U7A, U9A and U12A - the compositions of which are given in Table 1. Measurements of internal friction were taken on a relaxator at a frequency of 1 cps. Results for two steels are given in Fig. 1, where the internal friction is plotted against temperature. The curves contain the usual maxima at 200 °C. The curves with the higher peaks are for the steel with the greater amount of carbon. The absolute values of the peaks are given in Table 2. Working in the cold leads to a decrease in the value of the peak corresponding to the decrease in the retained quantity of austenite. Fig. 2 shows the internal friction - temperature curves for U9A steel after quenching from sub-critical temperatures (720 °C and 670 °C). A low maximum is obtained at 200 °C, much less than that after quenching from the austenitic condition. Thus, the 200 °C peak can be explained by two phenomena taking

Card 1/3

S/126/60/010/02/015/020
E021/E335

The Nature of the Maximum of Internal Friction in Steel After Thermal Treatment

place simultaneously: diffusion of carbon atoms in the retained austenite and migration of carbon atoms to the dislocation regions forming on account of the martensitic transformation and thermal stresses. Further experiments were carried out on armco iron containing 0.019% carbon after 25% and 75% deformation. Fig. 3 shows the curves obtained. Deformation of 25% leads to two peaks at 40 and 200 °C. 75% deformation gives one peak at 200 °C. The disappearance of the first peak can be explained by migration of carbon atoms in the alpha-iron to more energetic positions - in dislocations. The peak at 200 °C is much lower than for quenched steels because of the smaller amount of austenite.
There are 2 tables, 3 figures and 10 references: 2 German, 2 English and 6 Soviet.

Card 2/3

S/126/60/010/02/015/020
E021/E335

The Nature of the Maximum of Internal Friction in Steel After Thermal Treatment

ASSOCIATIONS: Tul'skiy mekhanicheskiy institut
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SUBMITTED: Fenruary 18, 1960

Card 3/3

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S/126/60/010/005/013/030
E111/E452

AUTHOR: Krishtal, M.A.

TITLE: Concentration of Vacancies in Iron-Chromium Alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.5, pp.720-726

TEXT: The author criticizes evaluation (Ref.1,2) of vacancy concentration from measurement of electrical resistivity of quenched specimens: the temperature vs vacancy concentration relation could be distorted by polymorphic changes. He recommends measurement of resistivity during heating to high temperatures and describes his work on this. The wire specimen was held (Fig.1) at a pressure of the order of 10^{-3} mm Hg in a quartz U-tube in a furnace at up to 1400°C: the ends of the tube were outside the furnace and the specimen ends passed out through rubber bungs and were connected to a type МОД-49 (MOD-49) bridge. The range of compositions (%) covered was 0.013 to 0.040 C, traces and 0.02 Mn, traces - 0.011 Si, 0.008 to 0.030 P, 0.010 to 0.023 S, 0 to 5.72 Cr. Resistivity was found to increase linearly with chromium content (Fig.2). Fig.3 shows, for the 5.72% Cr alloy, resistance as a function of

85965

S/126/60/010/005/013/030
E111/E452

Concentration of Vacancies in Iron-Chromium Alloys

temperature: above 1140°C the experimental points deviate from the straight line. Table 2 gives resistance changes and temperatures for the various alloys: linear relations were obtained between the logarithm of resistance change and reciprocal of absolute temperature (Fig.4), the corresponding activation energies for vacancy formation increasing from 23800 cal/g atom for Armco-iron to 31200 for the 5.72% Cr alloy. Vacancy concentrations calculated from these results for Armco iron and each of the alloys are given in Table 3. They were checked by the internal friction method already described by the author (Ref.6): the internal friction peak at 40°C is determined for specimens with and without vacancies, the concentration being found from the difference. Vacancies were created by heating in vacuum to 1050 - 1370°C and quenching. Results for the 0.85% Cr alloy are shown in Fig.5 as plots of internal friction against temperature for various quenching temperatures. Table 4 like Table 3, shows that vacancy concentration rises regularly with higher heating temperature and lower chromium content. Table 4 also gives carbon concentration in

Card 2/3

85965
S/126/60/010/005/013/030
E111/E452

Concentration of Vacancies in Iron-Chromium Alloys

the solution and in the vacancies. Extrapolation suggests that at the melting point, vacancy concentration is about 0.1 at.%. There are 5 figures, 4 tables and 7 references: 5 Soviet and 2 Non-Soviet.

ASSOCIATION: Tul'skiy mekhanicheskiy institut
(Tula Mechanical Institute)

SUBMITTED: March 29, 1960

Card 3/3

S/123/61/000/011/020/034
A004/A101

AUTHORS: Krishtal, M. A.; Fominykh, I. P.; Lyzlov, B. A.

TITLE: Properties, structure and machinability of malleable cast iron with chromium and antimony for fittings

PERIODICAL: Referativnyy zhurnal, Mashinostroyeniye, no. 11, 1961, 3, abstract 11G18 ("Sb. tr. Tul'sk. mekhan. in-ta", 1960, no. 15, 20-26)

TEXT: An increase in the chromium content of the metal, when alloyed steel gets into the charge, causes a considerable prolongation of the annealing cycle and also tool breakage during the working of fittings as a result of insufficient annealing in the first stage. Investigations showed that a Cr-content of 0.15% is neutralized by the addition of 0.23% Sb to the cast iron. Cast iron containing 2.56% C, 1.5% Si, 0.15% Cr, 0.23% Sb, after heating to 960°C for 3 hours, holding of 15 hours, cooling down to 720°C for 2 hours and holding at this temperature for 10 hours, had the structure of pearlite malleable cast iron of the КЧ-54-5 (KCh-54-5) grade. Tests of the machinability showed that in the time interval between the sharpening of the taps 5-6 times more fittings from malleable cast iron alloyed with chromium and antimony (HB 170-200) could be

Card 1/2

S/123/61/000/011/020/034
A004/A101

Properties, structure and machineability ...

machined than those of ordinary non-alloyed cast iron. There are 3 figures.

L. Tumanova

[Abstracter's note: Complete translation]

Card 2/2

S/137/62/000/006/092/163
A160/A101

AUTHORS: Mirkin, I. L., Krishtal, M. A.

TITLE: The thermal mobility of atoms in alloys

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 7, abstract 6I43 (In collection: "Issled. novykh zharoprochn. splavov dlya energetiki". Moscow, Mashgiz, 1961, 5 - 33)

TEXT: Review. Discussed are the mechanisms of diffusion: the diffusion of the pair exchange, along the vacancies, along the interstices, and the annular diffusion. The results of work carried out on the determination of concentration of vacancies by the methods of measuring the electric resistance of alloys and of the internal friction are presented. The effect of the volumetric factor on the diffusion of elements dissolved by the principle of interstitial atoms is considered. As regards the diffusion of H, N, C, and B, a linear dependence of the energy of activation on the atomic diameter of the element was detected in α-Fe. In the case of diffusion along the interstices, the valence of dissolved elements has a secondary importance. The diffusion of elements dissolved in

Card 1/2

S/137/62/000/006/092/163
A160/A101

The thermal mobility of atoms in alloys

Fe and Ni by the principle of substitution is discussed in detail. The results of work on the investigation of simultaneous diffusion of several elements from one source are given. The effect of the structure on diffusion is investigated. The surface diffusion and the dependence of diffusion on crystallographic orientation are discussed. There are 49 references.

I. Leftonov

[Abstracter's note: Complete translation]

Card 2/2

30454
S/126/61/012/003/009/021
E193/E135

1.1700 1454

AUTHORS: Krishtal, M.A., and Mokrov, A.P.

TITLE: Work hardening of surface layers formed by diffusion of molybdenum into iron and its alloys

PERIODICAL: Fizika metallov i metallovedeniye, vol.12, no.3, 1961, 389-394

TEXT: One of the shortcomings of the diffusion method of surface-hardening of metal components is that they produce diffusion layers whose hardness and strength decrease with the distance from the surface. Means of attaining uniform mechanical properties across such diffusion layers are required, and a possible method for achieving uniformity in the mechanical properties is described in the present paper. The method proposed is based on the fact that (a) the variation of hardness is associated with the gradient of the alloying element concentration across the thickness of the diffusion layer; and (b) the rate of work-hardening of ferrite decreases with increasing content of alloying additions. Consequently, a diffusion layer subjected to plastic deformation should work-harden most in its softest part

Card 1/4

30454

S/126/61/012/003/009/021
E193/E135

Work hardening of surface layers ...

and least in the hardest region with the maximum concentration of the alloying additions. To verify this proposition a series of diffusion experiments were carried out. Diffusion couples were formed by a molybdenum foil (0.04-0.05 mm thick) sandwiched between strips of iron or one of the five types of iron-base alloys, containing up to 5 at.% Co, Si, Cr, W, and V. Good contact at the diffusion interface was ensured by spot-welding the components in hydrogen, after which they were subjected to a vacuum diffusion treatment for 10 hours at 1250 °C. Each diffusion couple was sectioned, and microhardness, H_μ, measurements were taken across the thickness of the diffusion layer at regular intervals. Each type of the specimen was then compressed to 10, 20, 30 and 40% reduction in thickness, after which the microhardness measurements were again carried out, the degree of localised deformation ε, %. in the diffusion layer being determined from the decrease in the distance between the original microhardness tester indentations. From these data the so-called specific microhardness $\Delta H_\mu/\varepsilon$ (where ΔH_μ is the increase in H_μ due to deformation ε) was determined which gave the measure

Card 2/5

30454

of work-hardenability of a particular region of the diffusion layer. The results are reproduced graphically, those obtained for the 5 at.% Co-Fe alloy being shown in Fig.3 where H_μ (kg/mm^2, left-hand scale), $\Delta H_\mu/\varepsilon$, and ε (%, extreme right-hand scale) are plotted against the distance (mm) from the surface of the diffusion layer formed by diffusion of molybdenum. Circles and squares denote H_μ before and after 40% total deformation, respectively; the variation of localised deformation ε in a specimen deformed to 10% reduction in thickness is denoted by white triangles, black triangles relating to specific microhardness ($\Delta H_\mu/\varepsilon$) of specimens deformed to 40% reduction in thickness. Analysis of these and other results showed that hardness of the diffusion layers studied varied across their thickness in accordance with the variation of the molybdenum content. The effect of plastic deformation (compression) on the variation of H_μ, ε, and $\Delta H_\mu/\varepsilon$ across the thickness of a diffusion layer was also dependent on the molybdenum content, the regions of low Mo content being preferentially work hardened. This proved the possibility of using plastic deformation to attain greater uniformity of mechanical

30454
S/126/61/012/003/009/021
E193/E135

Work hardening of surface layers ...

properties across surface diffusion layers. The beneficial effect of plastic deformation was most pronounced in the diffusion layers formed by molybdenum in the Fe-Si, and least noticeable in the Fe-V alloys.
There are 7 figures and 12 references: 4 Soviet-bloc, 4 Russian translations of foreign language articles, and 4 non-Soviet-bloc. The English language references read as follows:

Ref.2: C. Austin. Trans. ASM, 1943, Vol.31, 321.
Ref.4: C. Austin, L. Luite, R. Lindsay. Trans. ASM, 1945, Vol.35, 446.
Ref.5: C. Lacey, M. Gensamer. Trans. ASM, 1944, Vol.32, 88.

ASSOCIATION: Tul'skiy mekhanicheskiy institut
(Tula Mechanical Institute)

SUBMITTED: December 19, 1960

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32660
S/126/61/012/005/022/028
E040/E435

18.1151

AUTHORS: Krishtal, M.A., Baranova, V.I.

TITLE: Internal friction and electrical resistivity of ferro-chromium alloys

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.5, 1961, 768-771

TEXT: Due to the ease of formation of chromium carbides, the mobility of the carbon atoms in solid solutions of ferro-chromium alloys can be appreciably affected and with it the mechanical properties of the metal. The problem was examined by determining the kinetics of carbides dissolution in chromium-containing solid solutions during their heating prior to quenching. For this purpose, measurements were made of the internal friction and electrical resistivity of wire-shaped specimens 0.7 mm in diameter and 160 mm long. The specimens were completely annealed by holding for 2 to 3 hours at 1050°C and quenched in water from 720 to 1200°C. Before quenching, the specimens were heated in vacuo for 10 to 40 minutes, depending on the Cr content. Internal friction was measured by the torsional pendulum method in

Card 1/3

32660
S/126/61/012/005/022/028
E040/E435

Internal friction and electrical ...

vacuum relaxator apparatus. Annealed specimens containing chromium carbides were found to have no internal friction maximum on the temperature curve. However, specimens quenched from 800°C gave internal friction maxima corresponding to 30 to 40 and 170°C. The actual value of the internal friction peak rises with increasing temperature of quenching, reaches its maximum for the quenching temperature of 1050°C and then drops. The height of both internal friction maxima was found to be dependent on the chromium content in the alloy. The specific resistivity of the specimens diminishes with increasing quenching temperatures (up to 1100°C) and passes through a minimum at 1050°C but it increases if the specimens are quenched from temperatures exceeding about 1100°C. It is concluded that an increase of the quenching temperature leads to progressively higher carbon contents of the solid solution because of the rising solubility of chromium carbides. The concentration of carbon at points of its introduction into the solid solution rises up to a temperature of 1050°C, while further heating above this temperature leads to the formation of vacancies which tend to be occupied by carbon atoms shifting from the points

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32660

Internal friction and electrical ... S/126/61/012/005/022/028
E040/E435

of their original introduction. The lower temperature internal friction maximum (30 to 40°C) is believed to be connected with carbon migration in the stress field around the iron atoms. The high temperature internal friction maximum (170°C) is thought to be connected with the migration of carbon atoms in the solid solution around the chromium atoms and, perhaps, with their migration to positions surrounded by iron atoms. There are 4 figures and 5 Soviet-bloc references.

ASSOCIATION: Tul'skiy mekhanicheskiy institut
(Tula Mechanics Institute)

SUBMITTED: March 20, 1961 (initially)
May 8, 1961 (after revision)

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