SOV/137-57-1-1249

Translation from: Referativnyy zhurnal. Metallurgiya, 1957, Nr 1, p 163 (USSR)

AUTHOR: Bernshteyn, M. L.

TITLE: On Grain Boundaries in Metal Alloys (O granitsakh zeren v metallicheskikh splavakh)

PERIODICAL: Tr. Nauch.-tekhn. o-va chernoy metallurgii, 1955, Vol 6, pp 221-234

ABSTRACT: A critical survey of theories explaining the nature of grain boundaries (GB). A detailed examination was made of the N. T. Gudtsov theory, which relates the origin of GB properties that differ from the properties of the grains themselves with the distortion of the crystalline structure on the GB which develops during the crystallization of the metal. Various methods were examined for measuring internal friction (IF), which is the most sensitive to all changes of physicochemical properties of GB. A description is given of a simplified apparatus for determining the relative variations of IF. A detailed examination is made of a hysteresis-meter method developed by Boulanger (Compte Rendus de séance de l'Académie de Science, 1951, p 233), the mathematical treatment of the method is

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On Grain Boundaries in Metal Alloys

discussed, and the results of the apparatus constructed by that author for the investigation of the temperature relationship of IF of Al alloys are adduced. Ultraviolet microscopy (phase-contrast method) opens the broadest possibilities for the study of the GB structure.

A. F.

Card 2/2

BERNSHTEYN, M.L.; KISHINEVSKIY, V.B.

Apparatus for ultraviolet microscopy; review of foreign literature. Zab.lab.21 no.10:1256-1259 '55. (MIRA 9:1)

1.Obzor zarubezhnykh dannykh.
(Microscope)

BERNSHTEYN, M.L.

1408
ULTRAVIOLET MICROSCOPIC INVESTIGATION OF TITANIUM, NIOBIUM, AND CARBON ALLOY STRUCTURES. 62
V. P. Elyutin, M. L. Bernshtein, and Yu. A. Pavlov. (Moscow Inst. of Steel). Doklady Akad. Nauk S.S.S.R. 104, 546-8 (1955) Oct. 1. (In Russian)

The structures and properties of titanium—niobium alloy samples, melted in vacuum furnaces of graphite were studied. The content of niobium varied from 1.5 to 33.4%; content of carbon was within 0.7 to 0.9%. The samples were tempered in a vacuum at 1000°C. Ultraviolet microscopic studies determined the phase character of some multicomponent systems occurring in some samples. (R.V.J.)

(2)

BERNSHTEYN, Mark L'vovich; BAKHSHTADT, A.G., redaktor; GORDON, L.M., redaktor izdatel'stva; VAYNSHTEYN, Ye.B., tekhnicheskiy redaktor

[Steels and alloys for use at high temperatures] Stali i splavy dlia raboty pri vysokikh temperaturakh. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1956. 238 p. (MIRA 9:10)

(Metals at high temperatures)

POGODIN-ALEKSEYEV, Georgiy Ivanovich; GELLER, Yuliy Aleksandrovich; RAKHSHTADT, Aleksandr Grigor'yevich; LAKHTIN, Yu.M., professor, doktor tekhnicheskikh nauk, retsenzent; BERNSHTEYN, M.L., dotsent kandidat tekhnicheskikh nauk, redaktor; PETROVA, I.A., izdatel'skiy redaktor; GLADKIKH, N.N., tekhnicheskiy redaktor

[Physical metallurgy; methods of analysis, laboratory work and problems] Metallovedenie; metody analiza, laboratornye raboty i zadachi. Izd. 2-oe, perer. Moskva, Gos. izd-vo obor. promyshl., 1956. 427 p. (MLRA 9:10)

(Physical metallurgy)

AVRASIN, Ya.D., kandidat tekhnicheskikh nauk; BERG, P.P., professor, doktor tekhnicheskikh nauk, BERNSHTEYN, M.L., kandidat tekhnicheskikh nauk; GENEROZOV, P.A., starshiy nauchnyy sotrudnik; GLIKMER, B.M., inzhener; DAVIDOVSKAYA, Ye.A., kandidat tekhnicheskikh nauk; YELCHIN, P.M., inzhener; YEREMIN, N.I., kandidat fiziko-matematicheskikh nauk; IVANOV, D.P., kandidat tekhnicheskikh nauk; KNOROZ, L.I., inzhener; KOBRIN, M.M., kandidat tekhnicheskikh nauk; KORITSKIY, V.G., dotsent; KROTKOV, D.V., inzhener; KUDRYAVTSEV, I.V., professor, doktor tekhnicheskikh nauk; KULIKOV, I.V., kandidat tekhnicheskikh nauk; LEPETOV, V.A., kandidat tekhnicheskikh nauk; LIKINA, A.F., inzhener; MATVEYEV, A.S., kandidat tekhnicheskikh nauk; MIL'MAN, B.S., kandidat tekhnicheskikh nauk; PAVLUSHKIN, N.M., kandidat tekhnicheskikh nauk; PTITSYN, V.I., inzhener [deceased]; RAKOVSKIY, V.S., kandidat tekhnicheskikh nauk, RAKHSHTADT, A.G., kandidat tekhnicheskikh nauk; RYABCHENKOV, A.V., professor, doktor khimicheskikh nauk; SIGOLAYEV, S.Ya., kandidat tekhnicheskikh nauk; SMIRYAGIN, A.P., kandidat tekhnicheskikh nauk, SUL'KIN, A.G., inzhener; TUTOV, I.Ye., kandidat tekhnicheskikh nauk, KHRUSHCHOV, M.M., professor, doktor tekhnicheskikh nauk; TSYPIN, I.O., kandidat tekhnicheskikh nauk; SHAROV, M.Ya., inzhener; SHERMAN, Ya.I., dotsent; SHMELEV, B.A., kandidat tekhnicheskikh nauk; YUGANOVA, S.A., kandidat fiziko-matematicheskikh nauk; SATEL', E.A., doktor tekhnicheskikh nauk, redaktor; SOKOLOVA, T.F., tekhnicheskiy redaktor

[Machine builder's reference book] Spravochnik mashinostroitelia; v shesti tomakh. izd-vo mashinostroit. lit-ry. Vol.6. (Glav. red.toma E.A.Satel'. Izd. 2-oe, ispr. i dop.) 1956. 500 p. (MIRA 9:8)
(Machinery--Construction)

BERNSHTEYN, M.L.

BERNSHTEYN, M.L.

AL'TGAUZEN, O.N., kandidat fisiko-matematicheskikh nauk; BERNSHTEYN, M.L., kandidat tekhnicheskikh nauk; BLANTER, M.Ye., doktor tekhnicheskikh nauk; BOKSHTEYN, S.Z., doktor tekhnicheskikh nauk; BOLKHOVITINOVA, Ye.N., kandidat tekhnicheskikh nauk; BORZDYKA, A.M., doktor tekhnicheskikh nauk; BUNIN, K.P., doktor tekhnicheskikh nauk; VINOGRAD, M.I., kandidat tekhnicheskikh nauk; VOLOVIK, B.Ye., doktor tekhnicheskikh nauk [deceased]; GAMOV, M.I., inzhener; GELLER, Yu.A., doktor tekhnicheskikh nauk; GORELIK, S.S., kandidat tekhnicheskikh nauk; GOL'DENBERG, A.A., kandidat tekhnicheskikh nauk; GOTLIB, L.I., kandidat tekhnicheskikh nauk; GRIGOROVICH, V.K., kandidat tekhnicheskikh nauk; GULYAYEV, B.B., doktor tekhnicheskikh nauk; DOVGALEVSKIY, Ya.M, kandidat tekhnicheskikh nauk; DUDOVTSEV, P.A., kandidat tekhnicheskikh nauk; KIDIN, I.N., doktor tekhnicheskikh nauk; KIPNIS, S.Kh., inzhener; KORITSKIY, V.G., kandidat tekhnicheskikh nauk; LANDA, A.F., doktor tekhnicheskikh nauk; LEYKIN, I.M., kandidat tekhnicheskikh nauk; LIVSHITS, L.S., kandidat tekhnicheskikh nauk; L'VOV, M.A., kandidat tekhnicheskikh nauk; MALYSHEV,K.A., kandidat tekhnicheskikh nauk; MEYERSON, G.A., doktor tekhnicheskikh nauk; MINKEVICH, A.N., kandidat tekhnicheskikh nauk; MOROZ, L.S., doktor tekhnicheskikh nauk; NATANSON, A.K., kandidat tekhnicheskikh nauk; NAKHIMOV, A.M., inzhener; NAKHIMOV, D.M., kandidat tekhnicheskikh nauk; POGODIN-ALEKSEYEV, G.I., doktor tekhnicheskikh nauk; POPOVA, N.M., kandidat tekhnicheskikh nauk; POPOV, A.A., kandidat tekhnicheskikh nauk; RAKHSHTADT, A.G., kandidat tekhnicheskikh nauk; ROGEL'BERG, I.L., kandidat tekhnicheskikh nauk;

(Continued on next card)

AL'TGAUZEN, O.N.---- (continued) Card 2.
SADOVSKIY, V.D., doktor tekhnicheskikh nauk; SALTYKOV, S.A., inzhener; SOBOLEV, N.D., kandidat tekhnicheskikh nauk; SOLODIKHIN, A.G., kandidat tekhnicheskikh nauk; UMANSKIY, Ya.S., kandidat tekhnicheskikh nauk; UTEVSKIY, L.M., kandidat tekhnicheskikh nauk; FRIDMAN, Ya.B., doktor tekhnicheskikh nauk; KHIMYSHIN, F.F., kandidat tekhnicheskikh nauk; KHRUSHCHEV, M.M., doktor tekhnicheskikh nauk; CHERNASHKIN, V.G., kandidat tekhnicheskikh nauk; SHAPIRO, M.M., inzhener; SHKOL'NIK, L.M., kandidat tekhnicheskikh nauk; SHRAYBER, D.S., kandidat tekhnicheskikh nauk; SHCHAPOV, N.P., doktor tekhnicheskikh nauk; GUDTSOV, N.T., akademik, redaktor; GORODIN, A.M. redaktor izdatel'stva; VAYNSHTEYN, Ye.B., tekhnicheskiy redaktor

[Physical metallurgy and the heat treatment of steel and iron; a reference book] Metallovedenie i termicheskaia obrabotka stali i chuguna; spravochnik. Pod red. N.T.Dudtsova, M.L.Bernshteina, A.G. Rakhshtadta. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1956. 1204 p. (MLRA 9:9)

1. Chlen -korrespondent Akademii nauk USSR (for Bunin)
(Steel--Heat treatment) (Iron--Heat treatment)
(Physical metallurgy)

BERNSHTEYN, M.L.

GUDTSOV, N.T., akademik; BERNSHTEYN, M.L., kandidat tekhnicheskikh nauk.

"Tool steels" IU.A. Geller. Reviewed by N.T. Gudtsov, M.L. Bernshtein. Metalloved. i obr. met. no.9:58-60 S '56. (MIRA 9:11)

(Tool steel)
(Geller, IU.A.)

BERNSHTEYN, M.L.

BERNSHTEYN, M.L., referent.

Color microphotographs of iron alloys. Zav. lab. 23 no.3:338 '57.
(Iron alloys--Metallography) (MIRA 10:6)
(Photomicrography)

AUTHORS: Bernsteyn, M. L., Candidate of Technical Sciences 32-10-16/32
Blanter, M. Ye., Professor, Doctor of Technical Sciences
Lozinskiy, M. G., Doctor of Technical Sciences

TITLE: Achievements and Tendencies in the Development of Soviet Metallography (Dostizheniya i tendentsii v razvitii sovetskoy metallografii

PERIODICAL: Zavodskaya Laboratoriya, 1957, Vol 23, Nr 10, pp 1202-1211 (USSR)

ABSTRACT: In the introduction the history of the development if micro- and macroscopic research work carried out in the world (since the end of the 19th century) and in the USSR (since the October revolution) is described. The report is divided into 3 chapters entitled:
1.) Light microscopy. As the most notable the work carried out in this field by D. N. Rozhdestvenskiy, S. I. Vavilov, V. P. Lennik, and A. A. Lebedev is described. The optical industry of the USSR is at present producing the following apparatus (which are here described as being up-to-date): microscopes "MMM-8", "MMM-6" and "MMM-S, which are remarkable, besides their very uniform illumination, also by an additional lateral illumination and are destined for

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Achievements and Tendencies in the Development of Soviet 32-10-16/32
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enlargements of up to the three-fold. For the increase of the contrast effect (upon which special stress is laid here) an additional device is provided for the microscope "МИМ-8" consisting of: a metal mirror condenser with parabolic reflection, a ring-shaped diaphragm, and a shiftable auxiliary line. For this purpose a dark field is used. Furthermore, the use of "conical" and "polarized" light in the microscope is mentioned, but the implements necessary for this purpose are not described. As one of the "last achievements of optical technical engineering" the method of phase contrast is mentioned, which is based upon a specially constructed additional device "КФ-3" for the microscope "МИМ-8". Another additional device, called "MK", makes it possible to take photographs in the microscope by means of an ordinary camera. Furthermore, the "high pressure mercury light source" is described here as well as shortwave ultraviolet rays in the microscope in connection with the change of color. The respective apparatus is not described. Further, the newly constructed microscope "МИМ-14" with remote control for radioactive substances and a television microscope, which radiates a picture from a microscope on to

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Metallography

a screen, are mentioned. The make is not mentioned.

2.) High-Temperature Metallography. Works by I. A. Oding, and M. G. Lozinskiy of the Institute for Machine Science of the AN USSR are referred to. Research methods are divided into two groups: 1.) Methods for the investigation of the microstructure of heated metals and alloys, and 2.) methods for the investigation of the properties of metals under the influence of different temperatures. In general heating in a vacuum (in rarefied air) is dealt with, because, if these conditions prevail, the formation of crusts and films can be avoided. As a device suited for this purpose the "ИМАШ-5М" is mentioned, which makes it possible to carry out research work at temperatures of up to 1100°C at vacuum tensions of up to 60 kg/mm2 and to measure deformations. 3.) Measuring metallography (here described as utilization metallurgy). It consists in the measuring and judging of intercrystal and other structural intermediate distances, austenite transformations, structural shifting and other structural changes occurring in alloys when they are thermally or mechanically etc. treated. The most important works in this fields are by

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Achievements and Tendencies in the Development of Soviet 32-10-16/32
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S. A. Saltykov, I. L. Mirkin, A. A. Glagolev and the "very latest" are by L. S. Morozov, N. N. Sirota, S. Z. Boksteyn and M. M. Steinberg (this is an extract from the total list). There are 5 references, all of which are Slavic.

AVAILABLE: Library of Congress

1. **Science-USSR-Progress** 2. **Microscopy**

Card 4/4

SOV/137-58-9-19936

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 263 (USSR)

AUTHORS: Bernshteyn, M.L., Grinberg, M.L.

TITLE: The Influence of Recrystallization Texture Upon the Mechanical Properties of Metals (Vliyaniye tekstury rekristallizatsii na mekhanicheskiye svoystva metallov)

PERIODICAL: Metallovedeniye i term. obrabotka. Moscow, Metallurgizdat, 1958, pp 65-78

ABSTRACT: A study is made of the influence of plastic deformation and texture type upon the strengths of Armco Fe under various types of loading. It is established that the texture resulting from rolling increases σ_s to a greater degree (from 20.6 to 90.5 kg/mm^2 in tension and from 13.65 to 42.0 kg/mm^2 in torque) than does the texture resulting from drawing (up to 72.6 kg/mm^2 in tension and 31.2 kg/mm^2 in torque). The different effect upon increase in σ_s of rolled and drawn specimens is the consequence of differences in the texture of the Fe. In rolling, the metal undergoes work-hardening considerably more intensively in the vicinity of the (100) plane than in drawing, even if the degree of reduction is identical. In

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The Influence of Recrystallization Texture (cont.)

tensile testing, the σ_s of drawn and rolled specimens is higher than in torque testing. Bibliography: 16 references.

F.U.

1. Metals--Mechanical properties 2. Metals--Crystallization 3. Crystal structure--Metallurgical effects

Card 2/2

80189
SOV/123-59-23-97020

18.8200

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1959, Nr 23, p 118 (USSR)

AUTHOR: Bernshteyn, M.L.

TITLE: The Effect of Cold Hardening on the Structure and Properties of Heat-Resisting Steel Grades and Alloys

PERIODICAL: Tr. Sektsii metalloved. i term. obrabotki metallov. Tsentr. pravl. Nauchno-tekhn. o-va mashinostroit. prom-sti, 1958, Nr 1, pp 230 - 265

ABSTRACT: The theoretical conception of the hardening effect of cold-hardening was examined with specimens of EI395 grade steel of the following composition (in %): C - 0.11; Cr - 17; Ni - 24; Mo - 6.64; N_2 - 0.12; with specimens of Ni-alloy containing 0.075% C, 20.5% Cr, 0.04% Ce, 2.6% Ti, 0.56% Al, and of the KhN60 alloy (15% Cr, 62.5% Ni, 21.2% Fe and 0.19% C). The specimens of EI396 grade steel were subjected to cold hardening by stretching with 20% elongation and subsequent aging at 600 - 900°C with holding in the course of from 1 - 100 hours. The second lot of specimens underwent aging immediately after hardening. The specimens of the Ni-alloy (EI437) were cold-hardened by rolling and drawing with a reduction of 5.50 and 75%. Cold deformation was effected after hardening at various cooling

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The Effect of Cold Hardening on the Structure and Properties of Heat-Resisting Steel Grades and Alloys

rates, followed by aging at 500 - 800°C with holding in the course of from 5 - 5,000 min. The specimens of KhN60 alloy underwent rolling and drawing with 50% reduction. The cold-hardened specimens were subjected to various forms of mechanical testing. Also the specific electric resistance and "hot" hardness, measured in the vacuum, were determined. It was found that the distribution and size of particles of the hardening phase are important factors, specifying the heat resistance of the steel. The distribution of the phases being formed during the aging process, affects the toughness and the ductile characteristics of the steel. The particle size determines the hardness and strength characteristics during short-term tests. The size and distribution of particles of the hardening phase affect the characteristics of long-time and fatigue strength. 15 figures.

S.E.D.

Card 2/2

18(7)

AUTHORS: Bernshteyn, M. L., Knizhnik, G. S. SOV/163-58-4-37/47

TITLE: Influence of Cold Hardening on the Physical Properties of Technically Pure Iron (Vliyaniye naklepa na fizicheskiye svoystva tekhnicheski chistogo zheleza)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 4, pp 214-219 (USSR)

ABSTRACT: This investigation concerned the influence of cold plastic deformation at different states of tension (rolling and drawing) on the change of physical properties of technically pure iron with the following composition: 0.05% C, 0.12% Mn, 0.17% Si, 0.001% S, 0.001% P, 0.00028% Al_2O_3. Magnetic permeability of the material in dependence on the field intensity of the magnetizing field μ(H) was measured on an anisometer of the system of N. S. Akulov particularly prepared for these purposes. The following facts were ascertained by the investigation:

1) At great deformations causing a formation of texture the magnetic permeability is reduced. Magnetic permeability of the rolled samples is lower than that of the drawn samples.

2) Coercive force of the rolled samples is greater than that of

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drawn samples. 3) Electric resistance of the rolled samples is higher than that of drawn samples. A continuous increase of the electric resistance is, however, observed with an increase in the degree of deformation. 4) The blurring of the diffraction lines on X-ray diagrams taken of samples deformed by rolling and drawing is stronger in drawing than in rolling (at any degree of deformation). This can be explained by the formation of great tensions of the second type and a higher refinement of the blocks in drawing than in rolling. The tensions of the second type - blurring of the X-ray lines. (In the original, distortions and tensions of the second and third types are mixed up) 5) It is assumed that the changes of properties ascertained are determined by the fact that the tensions of the third type are greater in rolling than in drawing. There are 4 figures and 1 Soviet reference.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: January 7, 1958

Card 2/2

69402

SOV/137-59-4-8686

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 4, p 193 (USSR)

18.1150

AUTHORS: Gudtsov, N.T., Trubetskova, R.I., Bernshteyn, M.L.

TITLE: The Effect of Small Admixtures of Boron, Calcium, Niobium, Zirconium and Cerium on the Structure and Properties of High-Nickel Heat-Resistant Alloys

PERIODICAL: Sb. Mosk. in-t stali, 1958, Vol 38, pp 495 - 516

ABSTRACT: The authors investigated the effect of small admixtures of B (0.005%), Ca (0.1%), Nb (0.5%), Zr (0.2%) and Ce (0.01%) on the structure and properties of "N36KhTYu" type alloy. To investigate the effect of the crystallization rate of the metal, the ingots were cast into molds cooled with water, in air and in sand. Aging processes were investigated on forged specimens at 700 - 850°C after preliminary quench hardening at 1,200°C. It was stated that increased crystallization rate of the alloy, that did not contain admixtures, reduced considerably the extent of the zone of columnar crystals and led to a general refinement of crystallites. The same result is obtained by means of small admixtures of elements under any conditions of crystallization. The greatest effect on changes in the

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SOV/137-59-4-8686

The Effect of Small Admixtures of Boron, Calcium, Niobium, Zirconium and Cerium on the Structure and Properties of High-Nickel Heat-Resistant Alloys

macrostructure is exerted by Ce, followed by Zr, B, Nb and Ca. Aging entails increased hardness of all alloys. Alloys with small admixtures showed stronger solidification in aging, than an initial alloy without admixtures. Alloys with admixture of Nb, B and Zr showed the highest hardness at all investigated temperatures and times of aging. Raised proneness to aging and lower proneness to coagulation of particles of the strengthening phase in the alloy was confirmed by data obtained by measurements of electric resistance in continuous heating of alloys up to 1,200°C. Creeping tests of the alloys showed that small admixtures furthered increased heat resistance, obviously on account of their refining effect on the grain boundaries of the alloys.

V.M.

Card 2/2

PHASE I BOOK EXPLOITATION SOV/5555

Bernshteyn, M. L., Docent, Candidate of Technical Sciences.

Kurs lektsiy po metallovedeniyu, oborudovaniyu i tekhnologii termicheskoy obrabotki metallov; metallovedeniye zharoprochnykh splavov (Lectures on Physical Metallurgy, Equipment, and the Process of Metal Heat Treatment; the Physical Metallurgy of Heat-Resistant Alloys) Moscow, 1959. 49 p. 300 copies printed.

Sponsoring Agency: Moskovskiy institut stali im. I. V. Stalina. Kafedra metallovedeniya i termicheskoy obrabotki.

No contributors mentioned.

PURPOSE: This booklet is intended for students at metallurgical schools and for general readers interested in Soviet progress in physical metallurgy.

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COVERAGE: Principles of the physical metallurgy of heat-resistant steels and alloys are reviewed along with the development of testing and equipment operating under high pressures and at a high temperature. Efforts made to increase the heat resistance of steels and alloys and to improve their creep resistance and endurance are outlined, and the gradual progress made in this direction during the prewar and postwar years is described. Characteristics of steel and alloys used in the Soviet Union at various times are given and trends in the development of new heat-resistant alloys are indicated. Academician A. A. Bochvar is mentioned as an outstanding Soviet scientist who has contributed greatly to the progress made in the field of physical metallurgy. There are no references.

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AVAILABLE: Library of Congress (TA490. B38 1959)

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APPROVED FOR RELEASE: 06/08/2000 CIA-RDP86-00513R000205020007-5"

9(6)

SOV/32-25-2-31/78

AUTHORS: Bernshteyn, M. L., Paisov, A. I.

TITLE: Electron Microfractography (Elektronnaya mikrofraktografiya). Survey of Foreign Publications (Obzor zarubezhnoy literatury)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 2, pp 186 - 189 (USSR)

ABSTRACT: Compared with ordinary microscopes electron microscopes have a much greater focus depth and thus permit promising developments of electron microfractography of metal fractures and crystal textures. The pioneering work in this field was done by C. Crussard and others (Refs 1-6). Coal replicas are applied by means of two coal atomizers (Ref 3). The replicas can be removed chemically (Refs 8,9) or electrolytically (Ref 4). The article contains explanations of fractures resulting from slipping, and pertinent microphotographs (Figs 1-3). A microphotograph of a fracture with "cavities" (Fig 4) which is characteristic of "tough destructions" is also discussed. A fracture along the gliding surface (Figs 5,6) is discussed with reference to the studies made by Collette, Crussard (Ref 4) and others (Refs 3,5). In the explication

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Electron Microfractography. Survey of Foreign Publications SOV/32-25-2-31/78

of intercrystalline destructions observations made by Brammar, Honeycombe and Ward (Ref 9), Crussard et al (Refs 3,6), Bénard and Moreau (Refs 11,12) are mentioned. There are 8 figures and 14 references.

Card 2/2

BERNSHTEYN, M. L.

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. 326 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 mechanics 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.

Card 7/8

BERNSHTEYN, M.L., kand.tekhn.nauk; POLYANSKAYA, L.V., inzh.

Effect of peening on the structure and properties of the VT2 titanium alloy. Trudy Sik.metalloved.i term.obr.met.NTO mash.prom. no.2:18-24 '60. (MIRA 14:4)

(Titanium alloys—Metallography)

PURPOSE: This collection of articles is intended for metallurgists, mechanical engineers, and scientific research workers.

COVERAGE: The collection contains articles describing results of research conducted by members of NTO (Scientific Technical Society) of the machine-building industry in the field of physical metallurgy, and in the heat treatment of steel, cast iron, and nonferrous metals and alloys. No personalities are mentioned. Most of articles are accompanied by Soviet and non-Soviet references and contain conclusions drawn from investigations.

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A054/A026

18 1150

AUTHORS: Bernshteyn, M.L.; Svistunova, Z.V., Candidates of Technical ~~Sciences~~

TITLE: The Effect of Cold Hardening on the Structure and the Properties of the ЭИ437 (EI437) Grade Heat-Resisting Alloy 18

PERIODICAL: Stal', 1960, No. 4, pp. 358 - 362

TEXT: The structural changes of the EI437 type alloy during cold treatment, aging and the mechanism of strengthening are discussed. A nickel-chrome alloy, EI437, with the following composition was tested: C 0.075%; Mn 0.22%; Si 0.47%; S 0.0047%; P 0.009%; Cr 20.52%; Ce 0.04%; Ti 2.62%; Al 0.56%; Cu 0.02%; Fe 0.001%; Ni res. The alloy was rolled and drawn to harden it, quenching was started at 1,080°C, cooling was carried out by water, air and in the furnace (between 1,080 - 700°C: 125°C/h and up to 500°C: 40 - 50°C/h). After quenching and deformation the samples were repeatedly heated up to 500°C, 600°C, 700°C and 800°C for holding times up to 50,000 min, with compressions of 5%, 25%, 50% and 75%. The effect of various factors on the hardness and the electrical resistance of the alloy

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were analyzed in detail. It was found that the hardness of the alloy grows in each case of deformation in proportion to the degree of hardening, on account of the desintegration of the blocks, the increase in secondary distortion and the decomposition of the solid solution. The changes in hardness and electrical resistance observed at 500°C indicate that the decomposition of the solid solution starts already at this temperature. The increase in electric resistance is more pronounced in the samples deformed than in those not deformed due to the formation of atomic segregations in the solid solution. This increase depends on the rate of previous deformation, its accumulated energy contributing to the development of heterogeneity in the solid solution upon repeated heating. The electrical resistance is stabilized after a holding time of 5,000 min indicating two simultaneous processes: the decrease in electric resistance during the decomposition of the solid solution will be compensated by an increase upon the formation of heterogeneity, similarly to the phenomenon observed in "natural" aging. At 600°C the formation of heterogeneity in the solid solution and aging is more

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intensive than at 500°C. At a compression of 75% a decrease in hardness could be observed by a partial recrystallisation during a long heating interval. At 700°C hardness and electric resistance display a change which is characteristic of dispersion hardening. In samples considerably deformed high and stable values for hardness were observed. At a compression of 50% the hardness does not decrease, not even for a holding time of 50,000 min. According to X-ray analyses, the secondary distortion partially decreases when increasing the heating time at 700°C. When heating for 50,000 min, these distortions, as well as the indices for hardness, are identical for samples treated by rolling and drawing. Electron-microscopical tests proved that the high degree of hardness in samples compressed to 50% after a long aging is due to the maintenance of a highly dispersed condition of the second phase. The drop in hardness after 50,000 min is not only due to the coagulation of the second phase, but also to the beginning of recrystallization which is mainly remarkable in samples compressed to 75%. At 800°C decomposition, coagulation of the second phase and the recrystalliza-

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The Effect of Cold Hardening on the Structure and the Properties of the ЭИ437 (EI437) Grade Heat-Resisting Alloy

tion are still more pronounced. The decrease in hardness due to coagulation and recrystallization sets in the earlier, the greater the compression. The X-ray analysis of electrolytical deposits discovered in samples compressed to 50% and 75%, after aging for 30,000 min at 800°C, showed that hardening with the accumulation of surplus energy promotes the transformation of the cubic face-centered, metastable γ'-phase into a more stable η-phase (Ni_3Ti type) with hexagonal lattice. It can be concluded that the recrystallization of the cold-hardened EI437 alloy results at a long and repeated treatment at 700°C in the decrease of heat-resistance at this temperature. When heat treatment is carried out at 600 - 650°C, where the strengthening effects of tempering can still be maintained, the heat-resistance of the metal increased after the thermo-mechanical treatment. There are 7 figures, 1 table and 9 references: 8 Soviet and 1 German.

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69385

S/129/60/000/06/002/022
E073/E535

18.1150

AUTHORS: Bernshteyn, M.L., Candidate of Technical Sciences and Chzhu Zhi-Chzhan, Engineer

TITLE: Influence of Work Hardening on the Fine Structure of Heat Resistant Austenitic Steels

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, Nr 6, pp 7-9 + 1 plate (USSR)

ABSTRACT: Rods of 20 mm diameter from commercial melts of the following chemical compositions were investigated:
EI69 - 0.48% C, 13.92% Cr, 14.34% Ni, 0.3% Mo, 2.54% W;
EI395- 0.08% C, 15.91% Cr, 25.04% Ni, 6.4% Mo, 0.15% N_2.
The steel EI395 was quenched in water after heating for 40 mins at 1180°C. Following that, the specimens were machined, cold rolled and drawn with reductions of 25, 50 and 75% and then aged. Then, the specimens were subjected to X-ray diffraction and microscopic studies measuring also the hardness and the electric resistance. The size of the blocks and of the type II distortions were determined by means of a URS-50I ionization device using iron K-radiation. The widths of the (111) line and

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of the (311) line were determined and from the (311) line the lattice parameters were determined. In the hardened state the steels EI395 and EI69 have a single phase solid solution structure with hardness values of HB 186 and 239. The high hardness of work hardened specimens (plot, Fig 1) is due to the formation of fine submicroscopic structural nonuniformities and decomposition of the saturated solid solution. The rejected disperse phases are distributed uniformly throughout the body of the grain. X-ray diffraction studies have shown that, irrespective of the type of deformation, intensive fragmentation of the blocks will occur with increasing reductions resulting from plastic deformation in the cold state (Tables 1 and 2). The here given as well as other results show that the changes in the type II distortions of various alloys differ. It is probable that changes in the type II distortions are linked with the formation and annihilation

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of differing dislocations at the block boundaries in the case of large reductions. For ageing alloys the process of hardening depends on the rejection and the character of the distribution of hardening phases during plastic cold working and during the subsequent heating. Metallographic investigations indicate that work hardening changes greatly the structure of the alloys; numerous sliplines and twins formed in the investigated steels as a result of cold rolling or drawing which were distributed along the entire grain (Figs 2 and 3). Plastic deformation in the cold state leads to an increase in the electric resistance as a result of distortions in the crystal lattice and an increase in the micro-stresses, whilst decomposition of the solid solution by the plastic deformation brings about a drop in the electric resistance (Table 3); the small change in the electric resistance of specimens reduced by 25% is obviously due to the compensation of these two factors.

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Influence of Work Hardening on the Fine Structure of Heat Resistant Austenitic Steels

If the reduction is increased to 75%, the specific electric resistance decreases appreciably which shows the predominance of the influence of decomposition of the solid solution. Measurement of the lattice parameter after cold rolling showed that this parameter decreased intensively with increasing reduction (Fig 4); this can be considered as a direct proof of the decomposition of the saturated solid solution as a result of work hardening. There are 4 figures, 3 tables and 1 Soviet reference.

ASSOCIATION: Institut stali (Steel Institute)

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BERNSHTEYN, M.L.

81879

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E073/E135

18.7100
18.1130

AUTHORS: Bernshteyn, M.L. (Candidate of Technical Sciences) and Kovaleva, A.D. (Engineer)

TITLE: Changes in the Structure of the Cold Worked Steels 1Kh18N9T and Kh25T during Heating

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No 8, pp 25-30 (+ 1 plate)

ABSTRACT: The steels referred to are used extensively due to their resistance to the effect of acids, scale resistance and also heat resistance. During the process of manufacture of cold rolled or drawn tubes made of austenitic and ferritic steels, difficulties arise which are due to changes in the structure and properties of the metal and which are not always fully explained. For elucidating the nature of some of these changes, investigations were carried out which are described in this paper. The chemical compositions of the investigated steels were as follows:
Steel Kh25T: 0.15% C; 0.9% Si; 0.77% Mn; 26.7% Cr; 0.4% Ni; 0.73% Ti.
1Kh18N9T: 0.11% C; 0.62% Si; 0.17% Mn; 17% Cr; 8.7% Ni;

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Changes in the Structure of Cold Worked Steels 1Kh18N9T and Kh25T during Heating

Prior to cold rolling and cold drawing the blanks were pierced and rolled in hot rolling stands and subjected to preliminary tests. After hot rolling the tubes were quenched in water from 1100 and 950 °C respectively. Following that, the tubes were cold rolled or cold drawn with maximum degrees of deformation so as to obtain clearly pronounced textures. The reductions were 75% for the steel 1Kh18N9T and 95% for the steel Kh25T. From the tubes 20 x 20 mm specimens were cut which were heated to 400, 500, 600, 700 and 800 °C and held at each temperature for durations of 1, 5, 25, 50 and 100 hours. The structural transformations were studied by hardness measurements, microstructure study with an optical microscope, static metallography and X-ray structural analysis. The results of the changes in hardness and stretching of the grains in cold drawn and cold rolled tubes from the two steels are entered in Figs 1 and 2, and 3 and 4, respectively. The results show that quenched and cold worked austenite of the steel 1Kh18N9T is more inclined to develop phase transformations leading to an increase in hardness than annealed and cold deformed austenite which is characterised by a greater stability.

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Changes in the Structure of Cold Worked Steels 1Kh18N9T and Kh25T during Heating

Although the general relations remain the same, comparison of the graphs in Figs 3, 4 with those in Figs 1, 2, lead to the conclusion that in the steel Kh25T the transformations are considerably slower than in the steel 1Kh18N9T. It is possible that this is due not only to the differing nature of the forming phases, but also to a generally lower level of type II distortions in the ferritic steel than in the more strongly work-hardened austenitic steel. The experimentally established martensitic transformation in the steel 1Kh18N9T and the formation of a σ phase in the steel Kh25T during repeated heating of cold worked specimens lead to a further conclusion relating to the influence of the accumulated deformation energy on the distribution of the individual elements in the solid solution. The determined transformations in both these steels could not occur in the equilibrium state. Such occurrence is made possible in the temperature range 400-600 °C by a redistribution of the elements which leads to a lowering of the solid solution and formation of

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Changes in the Structure of Cold Worked Steels 1Kh18N9T and Kh25T during Heating

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islands which are poor in nickel. Apparently such lowering leads in many cases to the formation of thermodynamically more stable alloys. There are 5 figures.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

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83996

S/129/60/000/010/005/009
E193/E483

AUTHOR: Bernshteyn, M.L., Candidate of Technical Sciences

TITLE: Thermo-Mechanical-Magnetic Treatment of Metals and Alloys

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No.10, pp.31-36

TEXT: The object of the investigation, described in the present paper, was to compare the mechanical properties (yield point, U.T.S., true tensile strength, elongation, reduction of area, impact strength) of technical grade iron and steels 20, 45, У7 (U7) and У12 (U12), heat-treated in the normal way (quenched and tempered where applicable) or subjected to so-called thermo-mechanical-magnetic treatment. The treatment consisted of the following: (a) heating the specimens to the austenitic range (800 to 950°C, depending on the composition of the material) and holding at that temperature for 20 min; (b) subjecting the specimens maintained within the austenitic range to hot plastic deformation (by tension) in such a manner as to prevent recrystallization of the material; (c) water- or oil-quenching of the specimens placed in a magnetic field. The beneficial effect of

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Thermo-Mechanical-Magnetic Treatment of Metals and Alloys

this treatment varied, depending on the composition of steel and degree of plastic deformation, but the improvement in the properties studied was noticeable in every case and the material treated in this manner was free from the tendency to temper-brittleness. The improvement in the mechanical properties brought about by the thermo-mechanical-magnetic treatment is attributed to the following factors: (a) formation of preferred orientation due to plastic deformation; (b) fragmentation of blocks due to magnetostriction; (c) refining of the microstructure due to favourable arrangement of the martensite crystals which tend to orientate themselves with their long axes parallel to the direction of magnetization; (d) the arrangement of martensitic crystals, imposed by the magnetic domains' structure, minimizing the effect of the grain boundaries in the original austenite on the properties of martensite, particularly its proneness to temper brittleness. There are 4 figures and 8 Soviet references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

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20256
S/148/60/000/011/013/015
A161/A030

1.1700 also 1045, 1413

AUTHORS: Bernshteyn, M. L.; Tung Su-kuei, Svistunov, Z.V.

TITLE: The effect of workhardening on the fine structure of the EI437 alloy

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.11, 1960, 125 - 132

TEXT: The Moscow Steel Institute has studied the effect of workhardening on the heat-resistant ЭИ437 (EI437) alloy. The composition of the specimen's was: (%) 0.05 C; 0.04 Mn; C.46 Si; 20.8 Cr; 2.4 Ti; 0.8 Al; 0.004 S; 0.007 P; 0.05 Ce; 0.05 Fe; 0.04 Cu; the content of harmful impurities (Pb, Sb, As, Bi and other) was not beyond the amount permissible. Workhardening was applied to blanks cut from rolled 35 mm diameter rods, quenched from 1080°C (and soaked for 8 hours) and cooled in air, then aged at 700°C for 50, 500, 5000 and 50,000 minutes. One part of the blanks was cold rolled with 25 - 50 % reduction, one part cold drawn with the same reduction, and one part left unworkhardened. The structure was studied with

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The effect of workhardening on the . . .

an optic and an electronic microscope, and with an X-ray camera. The article includes photo micrographs and graphs showing the measured variations of hardness and electric resistance, and of the structure block dimensions and microstresses. It was stated that the workhardened metal was not homogeneous. [Abstractor's note: Photomicrographs in the abstract are cuts from the original in the article.] The numerical data obtained are the following:

The working	Hardness H_V	Blocks size D 10^{-8}, cm^2	Distortions of 2nd order 10^{-3}
Quenching only	150	1500	0.88
Quenching + rolling (with 25% reduction)	267	670	1.40
Quenching + rolling (with 50% reduction)	340	220	1.64
Quenching + drawing (with 50% reduction)	380	370	2.18

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The structure seen under the electronic microscope was heterogeneous (Figure 6) even without heat application after coldworking. The variations of electric resistance indicated very intensive further aging, though the dimensions of the second phase remained very disperse and much smaller (~300 Å) than in specimens left without workhardening (~700 Å). This phenomenon is apparently connected with the refining of the blocks and more uniform distribution of the second phase particles that are located not on the grain boundaries only but also on the lines of shearing and twinning. The increasing number of volumes in which a phase separation is possible results in refining of the grain. The conclusion was made that drawing raised hardness more than rolling with the same reduction. This seems to be due to the specific effect of different texture types and a more complex stress pattern in drawing. The higher 2nd-order distortions value after drawing confirms this assumption. It seems that the main factors dedetermining the high strength of coldworked and aged specimens are: decomposition of the supersaturated solid solution with the formation of very disperse phase particles; refining of the mosaic blocks; the usual growth of the blocks in aging at 700° and decrease of the 2nd order distortions. But the intensity of these processes is low, which might be con-

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nected with a simultaneous decomposition process and formation of phases that are splitting the blocks and raising the 2nd order distortions, i.e., with inverse processes. Coagulation of phases in workhardened specimens obviously goes on within single blocks (that stay refined for long time), mainly on account of additive separations from a solid solution. There are 7 figures.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: Febr. 25, 1960

Figure 1: Structure after quenching from 1080°C, 8 hours holding and air cooling. X 25,000.

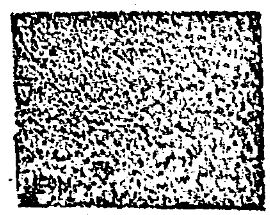

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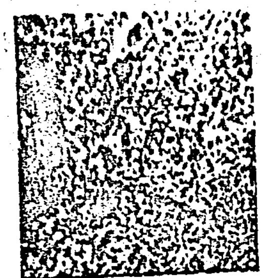
Figure 3: Structure after quenching from 1080° (air) and aging for 50,000 min in 700°. ×1000.

(1)



(2)

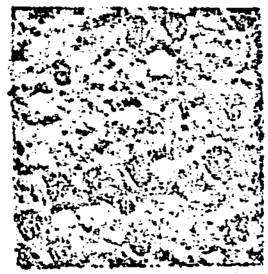


Figure 4: (1) After quenching from 1080° (air) and aging in 700 for 5000 min; (2) same after aging for 30,000 min. ×25.000.

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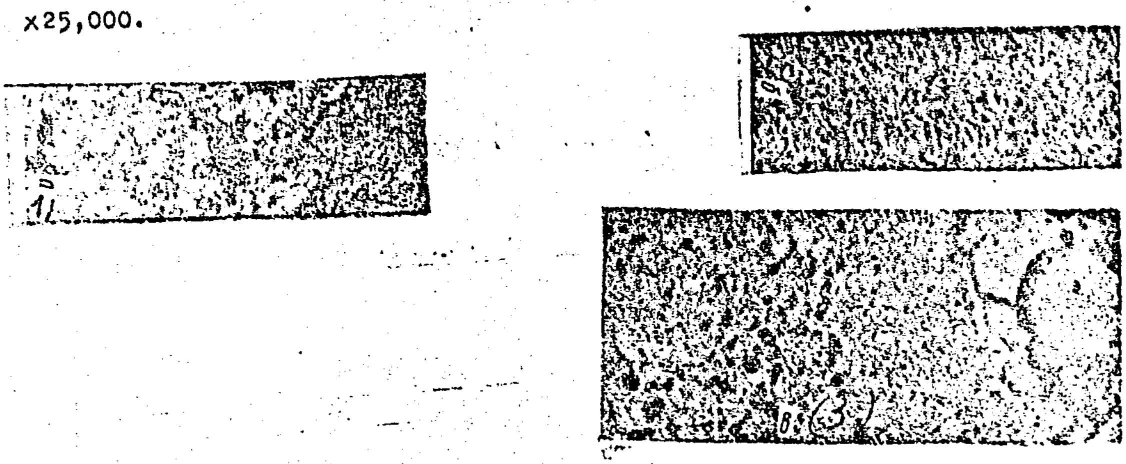
Figure 6 (1) Rolling with 50 % reduction, no aging; (2) rolling with 50 % reduction, aging in 700° for 5000 min; (3) same, after 30.000 min aging. x25,000.



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KACHANOV, N.N.; SPRISHEVSKIY, A.I.; KHASIN, G.A.; BERNSHTEYN, M.L.

What should a modern metallographic microscope be like?
Zav.lab. 26 no.6:770-773 '60. (MIRA 13:7)

1. Nauchno-issledovatel'skiy i eksperimental'nyy institut podshipnikovoy promyshlennosti (for Kachanov and Sprishevskiy). 2. TSentral'naya zavodskaya laboratoriya Zlatoustovskogo metallurgicheskogo zavoda imeni I.V.Stalina (for Khasin). 3. Moskovskiy institut stali im. I.V.Stalina (for Bernshteyn).

(Microscope)

S/032/60/026/009/003/018
B015/B058

AUTHORS: Myuller, N. N., Bernshteyn, M. L.

TITLE: Application of the Microscopic Method for Studying Structural Characteristics of Real Crystals

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol. 26, No. 9, pp. 1034 - 1086

TEXT: The structural characteristics of samples from refractory austenitic ЭИ395 (EI395) steel (16% Cr, 25% Ni, 6% Mo, 0.1-0.2% N_2, up to 0.1% C), from the refractory ЭИ437 (EI437) alloy of the type "nimonik-80", and from metallic deformed chromium, were microscopically investigated. The EI395 steel was hardened at 1200°C, cold-formed, and subjected to aging for various periods at from 500° to 700°C. After differential thermal pre-treatment, the polished sections were electrolytically etched. On the basis of photographs (Fig. 1) of the microstructure, it is stated among other things that the microscopic picture obtained is to be explained by the dislocations of plastic deformation. The EI437

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alloy also underwent thermomechanical pre-treatment and electrolytic polishing. The structural pictures (Fig. 2) also show "pitting beads" at the grain boundaries, like in EI395 steel, and it is stated that at first gliding only takes place on grains suitably oriented in correspondence. The etched spots are in no connection with a possible phase formation. Metallic deformed chromium underwent "thermal etching", i.e., heating in the МВП-2 (MVP-2) furnace in helium- or argon atmosphere at 1500°C for 12 or 24 hours. The influence of inclusions on gliding can be seen in Fig. 3 and it follows therefrom among other things that the deforming influence of inclusions on the configuration of the gliding structure is also visible at some distance from the inclusion. The change of the direction of gliding at the grain boundaries of metallic chromium is shown in Fig. 4. The present experiments showed that a propagation of deformation from one grain to the other does not take place in chromium in any case, which is in accordance with the brittle character of chromium rupture. There are 5 figures.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

BERNSHTEYN, M.L., dotsent, kand.tekhn.nauk; KULESHOVA, N.N., inzh.

Effect of austenitising conditions on the tendency of steel toward temper brittleness. Sbor.Inst.stali no.39:297-305 '60. (MIRA 13:7)

1. Kafedra metallovedeniya i termicheskoy obrabotki Moskovskogo ordena Trudovogo Krasnogo Znameni instituta stali imeni I.V. Stalina.

(Steel--Brittleness) (Tempering)

BERNSHTEYN, M.L., dotsent, kand.tekhn.nauk; KREYMERMAN, G.I., inzh.

Effect of texture on the mechanical properties of KhN60 nickel-chromium-iron alloys. Sbor.Inst.stali no.39: 345-361 '60. (MIRA 13:7)

1. Kafedra metallovedeniya i termicheskoy obrabotki Moskovskogo ordena Trudovogo Krasnogo Znameni instituta stali im. I.V. Stalina.

(Nickel-chromium-iron alloys--Cold working)

S/137/62/000/001/152/237
A006/A101

AUTHORS: Bernshteyn, M.L., Trubetskova, R.I.

TITLE: The effect of admixture of some elements on the properties of nickel-chrome austenite alloy

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 1, 1962, 42, abstract 1I296 (V sb. "Stal'", Moscow, Metallurgizdat, 1961, 462 - 468)

TEXT: The authors studied the effect of microadmixtures (in %) of B 0.005, Nb 0.5, Ca 0.1, Zr 0.2, Ce 0.01, on the structure and properties of a Н36ХТЮ (N36KhTYu) type alloy. It was established that the admixtures refined the crystallites in the cast metal, reduced the zone of columnar crystals (in particular Ce) increased surface tension (in the order of increase: Ce, Zr, Ca, B) raised the temperature of maximum ductility (in particular B), increased the deformation resistance (in particular Zr and Ca). The admixtures affect the aging process due to lesser diffusion into an additionally alloyed solid solution, and also due to the changes in the composition and nature of carbide phases when adding Nb, whose effect is the greatest. The authors established the effect of admixtures on in-

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ternal friction, measured by the method of torsion oscillations during continuous heating up to 800°C. Admixtures (in particular Zr and Ce), increase creep resistance at the first stage.

Ye. Bukhman

[Abstracter's note: Complete translation]

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E073/E535

1.1700

AUTHORS: Astaf'yeva, Ye. V., Candidate of Technical Sciences,
Bernshteyn, M.L., Candidate of Technical Sciences,
Kidin, I.N., Doctor of Technical Sciences,
Katok, A.M., Engineer and Tsypina, Ye. D., Engineer

TITLE: Strengthening of alloyed constructional steel by thermomechanical treatment

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1961, No.8, pp.54-56 + 2 plates

TEXT: The authors have tried out the effect of thermomechanical and thermo-mechanical-magnetic treatment of the steels 40ХIНВА (40Kh1NVA) (0.39% C, 1.43% Cr, 1.59% Ni, 0.8% W) and 37ХН3А (37KhN3A) (0.40% C, 1.3% Cr, 3.9% Ni). From annealed steel, flat specimens of various thicknesses were produced, all of which were then deformed to a final thickness of 3 mm. The specimens were heated at 930-950°C for 20 min and, following that, they were hot rolled on a two-high mill or, alternatively, prior to rolling they were placed into a furnace where the temperature was maintained at 540 to 560°C (steel 40Kh1NVA) or 470 to 480°C for the steel

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37KhN3A and held at these temperatures for 3 min. After rolling, the specimens were oil quenched. However, the specimens which were subjected to intermediate isothermal soaking were air quenched. Some of the specimens were quenched in a magnetic field produced by a solenoid and so spaced that all the specimens were under equal magnetic conditions. The field strength was low, about 1300 Oe, and therefore the influence of the thermomagnetic treatment was not fully apparent. The quenched specimens were subjected to low temperature tempering at 100 and 200°C with a holding time of 2 hours, followed by cooling in air. Prior to the experiments, the specimens were straightened and also ground along the contour and along the surface. Further experiments were carried out on specimens which prior to heating were ground and then quenched whilst inside punches. As a result of this the mechanical properties improved. Fig.3 shows the mechanical properties (HRC, σ_b, kg/mm^2, ψ, δ, % vs. degree of deformation, %) of the steel 37KhN3A after thermomechanical treatment in accordance with the following regimes: 1 - heating to 930°C, deformation (80% reduction), immediate quenching, tempering at 100°C; 2 - same as (1) except that tempering

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was at 200°C; 3 - heating to 930°C followed by cooling down to 470°C, deformation and tempering at 100°C; 4 - same as (3), tempering at 300°C. For comparison the appropriate values obtained by ordinary heat treatment are shown by a horizontal line with a shaded area (at the left-hand side of the plot). The following conclusions are arrived at:

1. After thermomechanical treatment both steels showed stable UTS values of 245-255 kg/mm^2 with relative contractions of 25-30%.
2. The high mechanical properties after thermomechanical treatment are attributed to the high degree of dispersion and also to the fact that some structural elements are oriented.
3. From the technological point of view, the thermomechanical treatment with forming at temperatures above Ac_3 are favourable; such treatment yields an optimum combination of strength and ductility.
4. Application of a magnetic field during austenite-martensite transformation leads to more uniform mechanical properties and a slight increase in strength.

There are 3 figures and 2 Soviet references.

BERNSHTEYN, M.L., kand.tekhn.nauk

"Theory of creep and durability of metals" by I.A. Oding and others. Reviewed by M.L. Bernshtein. Metalloved. i term.obr. met. no.12:53-54 D '61. (MIRA 14:12)

(Creep of metals)

(Oding, I.A.)

S/737/61/000/000/008/010

AUTHORS: Bernshteyn, M.L., Trubetskova, R.I.

TITLE: Effect of small additions of some elements on the properties of a NiCr austenite alloy.

SOURCE: Stal', sbornik statey. Ed.by A.M.Yampol'skiy. Moscow. 1961, 462-468.

TEXT: The paper reports an investigation of the effect of small additions of B (0.005%), Nb (0.5%), Ca (0.1%), Zr (0.2%), and Ce (0.01%) on the properties of a NiCr austenitic alloy of the type of H36XTЮ (N36KhTYu) with an elevated O content. The alloy was fused in a 55-kg HF furnace and top-cast into 10-kg cast-iron molds. W Mo thermocouples measured the temperature (T) of the liquid metal. The deformability of an alloy with given additions was measured by the hot-twisting method at 900-1200°C. Other parts of the ingots were forged into rod-shaped test specimens. The aging of specimens quenched at 1200° was investigated at 700-850° by means of dilatometry, electric-resistance measurement during continuous heating to 1200° and cooling, hardness testing, and microstructural analysis. High-temperature relaxation phenomena were studied by internal-friction and creep measurements. The effect of the additions on the surface tension was ascertained by measurements of the angle of groves on microsections heated during 4-6 hours to

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about 1200° in a vacuum of about 10^{-5} mm Hg. Macrostructural templet analysis showed that small additions reduce the size of the crystallites in the cast metal and decrease the extent of the zone of columnar crystals. The sequence of effectiveness is: Ce, Zr, B, Nb, and Ca. The surface-tension experiments (procedure and statistical numerical results are detailed) show all additives except Nb to be surface-active in the following order of diminishing activity: B, Ca, Zr, Ce. Correlation with V.K.Semenchenko's theoretical calculations (no reference given) is good, except for a reversal of the sequence of B and Ca. The hot-twisting test evinces the greates plasticity at 1000°C. Small additions increase it at higher T in the same order of effectiveness as the surface-tension tests. The dilatometric curves show two transformations: An irreversible volume reduction and hardening at 500-600° and a reversible volume increment at 700-900°, accompanied by softening engendered by coagulation and reverse dissolution of the phases. The additions do not affect the hardening but shift the coagulation and reverse dissolution toward higher temperatures (especially Nb and Zr). Age-hardening is favored by additions (especially Nb, B, and Zr) which, apparently, modify the composition of the hardening phase and which, also, impair the diffusion in the parent solution, which retards phase coagulation. The sequence of effectiveness in this respect does not appear related to the surface-activity sequence. Internal-friction measurement on 1200°-quenched specimens was performed by the torsional-vibration method under continuous heating to 800°. A sharp grain-boundary peak appears at 550-750°. Additions of Ba, Ca, and Zr reduce the height of the maximum and the slope of the descending branch of the curve. At temperatures beyond 750° the internal friction increases further. Creep tests show that small additions produce a clear-cut increase in creep strength in the "first stage" of creep. The creep-strength effectiveness sequence (in descending order) is Zr and Ce (nearly equal), Ca, B, Nb. The results of the internal-friction and creep tests suggest that the refining action of the addition raises the strength of the boundaries. Simultaneously the surface-active effectiveness of the elements appears to lead to an undesirable lowering of the boundary energy of the grains which may lead to flow processes near the boundaries. Despite the lowering of the grain-boundary peak of the internal friction and the increased creep-stability of alloys with additives, the shapes of the curves indicate that already-refined alloys with elevated surface energy will be more resistant to grain-boundary flux (slippage) under the simultaneous effect of high temperatures and stresses. There are 3 figures; no references.

ASSOCIATION: None given.

ALFEROVA, N.S., doktor tekhn. nauk; BERNSHTEYN, M.L., kand. tekhn. nauk; BLANTER, M.Ye., doktor tekhn. nauk; BOKSHTEYN, S.Z., doktor tekhn.nauk; VINOGRAD, M.I., kand. tekhn.nauk; GAMOV, M.I., inzh.; GELLER, Yu.A., doktor tekhn. nauk; GOTLIB, L.I., kand. tekhn. nauk; GRDINA, Yu.V., doktor tekhn.nauk; GRIGOROVICH, V.K., kand. tekhn. nauk; GULYAYEV, B.B., doktor tekhn. nauk; DOVGALEVSKIY, Ya.M., kand. tekhn. nauk; DUDOVTSEV, P.A., kand. tekhn. nauk [deceased]; KIDIN, I.N., doktor tekhn. nauk; LEYKIN, I.M., kand. tekhn. nauk; LIVSHITS, B.G., doktor tekhn. nauk; LIVSHITS, L.S., kand.tekhn. nauk; L'VOV, M.A., kand. tekhn. nauk; MEYERSON, G.A., doktor tekhn. nauk; MINKEVICH, A.N., kand. tekhn. nauk; NATANSON, A.K., kand. tekhn. nauk; NAKHIMOV, A.M., inzh.; NAKHIMOV, D.M., kand. tekhn. nauk; OSTRIN, G.Ya., inzh.; PANASENKO, F.L., inzh.; SOLODIKHIN, A.G., kand. tekhn.nauk; KHIMUSHIN, F.F., kand. tekhn. nauk; CHERNASHKIN, V.G., kand. tekhn. nauk; YUDIN, A.A., kand. fiz.-mat. nauk; YANKOVSKIY, V.M., kand. tekhn. nauk; RAKHSHTADT, A.G., red.; GORDON, L.M., red. izd-va; VAYNSHTEYN, Ye.B., tekhn. red. (Continued on next card)

[Metallography and the heat treatment of steel]Metallovedenie i termicheskaia obrabotka stali; spravochnik. Izd.2., perer. i dop. Pod red. M.L.Bernshteina i A.G. Rakhshtadta. Moskva, Metallurgizdat. Vol.2. 1962. 1656 p. (MIRA 15:10)

33462
S/129/62/000/001/005/011
E073/E483

1.1700

AUTHORS: Bernshteyn, M.L., Candidate of Technical Sciences, Demina, E.L. and Safonova, K.E., Engineers

TITLE: Thermomechanical treatment of ball-bearing steel

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no.1, 1962, 23-28

TEXT: The authors investigated the influence of thermomechanical treatment on the structure and properties of ball-bearing steel ШХ15 (ShKh15) (1% C, 1.3% Cr, 0.3% Mn, 0.2% Si, 0.01% S, 0.02% P). Cylindrical and flat specimens were deformed by rolling at a temperature above Ac_3, total reductions (estimated by means of a logarithmic formula) of 5, 10, 25, 50 and 80% being attained in a single pass. The cylindrical specimens were tempered at 140, 240 and 440°C for 4 hours. The flat specimens were tempered at 240°C (24 hours), 450, 500 and 550°C (30 min). Air cooling was applied in every case. X-ray investigations were made on specimens cut from the centre of the rolled and quenched specimens that had not been subjected to mechanical tests.

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E073/E483

Thermomechanical treatment ...

Bending tests on cylindrical specimens (N.I.Dolshenko participated in these tests) indicated that a considerable increase in strength and a sharp increase in ductility were obtained as a result of thermomechanical treatment. The results obtained with 180 mm long, 4 mm thick specimens, subjected to thermal or thermomechanical treatment followed by tempering for 24 hours at 240°C, indicated that if the thermomechanical treatment is applied under optimum conditions, material can be produced which even under unfavourable test conditions will exhibit bending strength of 400 kg/mm^2, as compared with 140 kg/mm^2 for specimens that had been subjected to conventional heat treatment. Bending tests on flat micro specimens yielded similar results. These specimens were subjected to the following treatment: heating to 930°C for 20 min, reduction by rolling in a single pass with reductions of 7, 25, 65 and 90%, immediate quenching in oil, followed by tempering at 450°C for 30 min. For comparison, a batch of specimens was subjected to the same heat treatment without plastic deformation. In the latter case the bending strength increased to 100 kg/mm^2, against

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320 kg/mm^2 attained in specimens deformed to 90% reduction; in addition, the thermomechanical treatment brought about an almost four-fold increase in ductility, which is particularly important since this steel had a strong tendency to brittle failure. It was found that the properties imparted to steel by thermomechanical treatment were retained at tempering temperatures of 500 and 550°C. The strengthening effect of the work-hardening during thermomechanical treatment is very stable and this is attributed to the fact that plastic deformation produces a particularly fine structure of the austenite which, in turn, ensures high dispersion and submicroscopic nonuniformity of the subsequently formed martensite. It is also possible that some texturing occurs. X-ray structural investigations show that the density of crystal lattice defects increases with increasing degree of deformation during thermomechanical treatment. The actual values after ordinary heat treatment and after thermomechanical treatment with 90% reduction were, respectively: 2.0×10^{11} cm^2/cm^3, 3.35×10^{11} cm^2/cm^3 after

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Thermomechanical treatment ...

tempering for 24 hours at 200°C; 1.49 x 10^{11} cm^2/cm^3, 3.24 x 10^{11} cm^2/cm^3 after tempering for 2 hours at 300°C; 7.94 x 10^{10} cm^2/cm^3 after ordinary heat treatment; 19.3 x 10^{10} cm^2/cm^3 after tempering at 400°C for 2 hours. The size of the regions of coherent scattering decreases with increasing deformation. Stresses of the second type in thermomechanically treated specimens tempered at 400°C decrease monotonously with increasing deformation. The results obtained indicate that thermomechanical treatment with high degrees of deformation reduces the influence of the tempering temperature on the block dimensions which, in the case of smaller blocks, increase at high tempering temperatures only. It is possible that this explains, to some extent, permanence of the effects of work-hardening and reversibility of the thermomechanical treatment. There are 5 figures, 3 tables and 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc. The reference to an English language publication reads as follows:

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Thermomechanical treatment ... E073/E483

Ref.2: J. K. Williamson, R. Smallman. Phil. Mag., 1956.

ASSOCIATION: Moskovskiy institut stali
(Moscow Institute of Steel)

X

Card 5/5

L 05719-67 EWT(m)/T/EWP(t)/ETI/EWP(k) IJP(c) JD/HW/DJ

ACC NR: AR6014354 (A, N) SOURCE CODE: UR/0277/65/000/011/0010/0010

AUTHORS: Konter, L. Ya.; Zakharova, V. L.; Bernshteyn, M. L.; Cherukha, L. G.

TITLE: An investigation of high-temperature thermomechanical treatment of bearing steel

SOURCE: Ref. zh. Mashinostroitel'nyye materialy, konstruktsii i raschet detaley mashin. Gidroprivod, Abs. 11.48,81

REF SOURCE: Tr. Vses. n.-i. konstrukt.-tekhnol. in-ta podshipnik. prom-sti, no. 4(40), 1964, 12-24

TOPIC TAGS: bearing steel, metallurgic research, mechanical heat treatment, metal property, hardening, roller bearing, ~~metallurgic process, steel~~, steel structure / ShKh15 steel

ABSTRACT: The influence of the high-temperature thermomechanical treatment (HTT) on the structure and properties of ShKh15 steel has been investigated. The HTT process involves heating in the interval of 910—1000C, deformation by rolling out to 10—50%, water or oil quenching and tempering. A control group of specimens was subjected to standard treatment. Applied at optimal conditions, HTT improves several properties of ShKh15 steel. An experimental technique of applying HTT to bearing rings has been developed, and a number of ball bearings and roller bearings has been produced for experimental purposes. 15 illustrations. Bibliography of 6 titles. [Translation of abstract]

UDC: 669.14.018.24

Card 1/1 SUB CODE: 11, 13

33468

18.1247 1454 1521 1418

S/129/62/000/001/011/011
E193/E383

AUTHORS: Lozinskiy, M.G., Doctor of Technical Sciences, Bernshteyn, M.L., Candidate of Technical Sciences and Vershinskaya, T.V., Engineer

TITLE: Polygonization of molybdenum studied by high-temperature metallographic methods

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no. 1, 1962, 57 - 64

TEXT: Owing to the resultant formation of fine inhomogeneities of the structure and increase in the recrystallization temperature, polygonization of metals brings about an improvement in the mechanical properties, both at room and elevated temperatures. This is particularly important in the case of Mo, which is mainly used in high-temperature applications and, consequently, it is important to establish heat- and mechanical-treatment procedures which would ensure polygonization of this metal and its alloys. Hence the present investigation, in which high-temperature metallographic methods such as described,

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Polygonization of ....

for instance, in Ref. 6 (M.G. Lozinskiy and N.Z. Pertsovskiy - Izv. AN SSSR, OTN, seriya Metallurgiya i toplivo, no. 1, 1961) were used. Experiments were conducted on vacuum-melted Mo containing small additions of Ti and Zr which constituted a solid solution and in which no solid transformation of any kind took place. The cast ingots were first hot-forged and then hot-rolled to 3.5 mm thickness, after which the material was annealed at 1 500 °C for one hour. Part of the annealed strip was rolled at 600 °C to 5, 7, 9 and 13% reduction in thickness and specimens of both annealed and work-hardened alloys were used for taking hardness measurements at 1 050, 1 100 and 1 150 °C. In the other series of experiments, electrolytically polished test pieces of annealed material were extended in vacuum at a constant rate of strain at 1 050 and 1 150 °C and after attaining elongation of 3, 6 and 13% were maintained under a load, photomicrographs of the surface of the test pieces being taken at various stages of this treatment. X-ray diffraction analysis was also carried out on test pieces stressed at elevated temperatures. The results obtained can be summarized as

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Polygonization of ....

follows.

1) Hot hardness of the alloys studied increases with increasing degree of preliminary plastic deformation but the longer the loading time used during the hardness measurements, the lower is the value of hardness obtained. This is illustrated in Fig. 2, where the Vickers hardness (HV) of various specimens is plotted against the loading time (min), the degree of preliminary plastic deformation (%) being indicated on each graph; experimental points denoted by circles, triangles and dots relate, respectively, to test temperatures of 1 050, 1 100 and 1 150 °C. It will be seen that an anomalous increase takes place in specimens preliminarily rolled to 9% reduction and that the hardness of specimens deformed to 13% reduction is higher at 1 150 °C than at 1 050 °C or 1 100 °C.

2) The increase in hardness with rising temperature is relatively small in specimens deformed to 5 and 7% reduction and large in more heavily deformed material, this increase being particularly pronounced in specimens given 9% reduction, which indicates that this treatment brings about polygonization

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of the alloy. In Fig. 3 the decrease in hardness (ΔH, kg/mm^2) is plotted against the test temperature, the degree of preliminary deformation being indicated by each curve.
3) The microhardness of the alloy at high temperature also varies with loading time. This is demonstrated in Fig. 4, where the microhardness (HV, kg/mm^2) is plotted against the loading time at 1 050 (graph a) and 1 150 °C (graph б), the degree of preliminary deformation being shown by each curve. It will be seen that the microhardness of all work-hardened specimens tested at 1 050 °C decreases monotonically with increasing loading time; the curves for specimens given 9 and 13% reduction and tested at 1 150 °C show a maximum at 30 and 80 min, respectively. The maximum increase in microhardness with increasing loading times is shown by a specimen deformed to 9% reduction and tested at 1 150 °C.
4) The results of X-ray diffraction analysis show that fragmentation of blocks in the course of plastic deformation is a characteristic feature of Mo and that the degree of

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Polygonization of ....

fragmentation can be assessed from the increase in the width of the X-ray lines. In Fig. 6, the increase in the width ($\beta 10^{-3}$ radians) of the (211) lines is plotted against the degree of deformation at temperatures indicated by each curve. It will be seen that a maximum degree of polygonization is attained in the material extended to 9% elongation at 1 150 °C. If, however, a specimen in this condition is held under a load at 1 150 °C for 80 min, the X-ray reflections become more diffuse, indicating that this treatment brings about an increase in the dimensions of blocks.
There are 8 figures and 10 references: 9 Soviet-bloc and 1 non-Soviet-bloc. The English-language reference mentioned is: Ref. 4: Cahn, R.W. - Proc. Phys. Soc., A63, 1950.

ASSOCIATIONS: Institut mashinovedeniya GKAMSM SSSR (Institute of Machine Science of GKAMSM USSR) Moskovskiy institut stali (Moscow Institute of Steel)

X

Card 5/5

36699 S/133/62/000/004/008/008
A054/A127

1.1710

AUTHORS: Bernshteyn, M.L.; Rakhstadt, A.G.; - Docents, Candidates of Technical Sciences

TITLE: Thermomechanical treatment of spring steel and its reversibility

PERIODICAL: Stal', no. 4, 1962, 346 - 348

TEXT: Steel alloys used for springs must display resistance to plastic deformation and resilience. To improve the properties of these alloys tests were carried out to include a thermomechanical treatment in the production process of laminated and helical springs. 55ХГР (55KhGR) and 65Г (65G) steels of the following composition were used in the tests: 55KhGR grade steel (in %): 0.53 C; 0.35 Si; 1.0 Mn; 1.1 Cr; 0.003 B; 0.03 Ti; 65G grade steel: 0.64 C; 1.05 Mn; 0.25 Si. The specimens of the first steel grade were heated up to 920°C, rolled on a two-high mill with reductions of 15, 25, 50 and 75% for one pass, then straightened under a press and air-cooled which, for this grade, was equivalent to complete hardening. After this the specimens were tempered at 100, 200, 250 and 300°C for 40 min. The 65G steel grade specimens were treated in 4 different ways: I) Refining and oil hardening at 870°C and tempering at 650°C

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A054/A127

Thermomechanical treatment of ....

for 1 1/2 h; II) refining + cold deformation (rolling) with a reduction of 12.5% + oil hardening at 870°C + tempering at 650°C for 1 1/2 h; III) refining + rolling (25%) + oil hardening at 870°C + tempering at 650°C for 1 1/2 h; IV) heating to 1,000°C + rolling (25%) quick oil hardening + tempering at 650°C for 1 1/2 h. It was found that the thermomechanical treatment of the 55KhGR steel grade (reduced by 25 - 50%, hardened and tempered at 250 - 300°C) considerably increased the strength and ductility of this spring steel. The thermomechanical treatment has a stabilizing effect on its characteristics, the practical importance being that this stabilizing effect on the steel can be preserved after additional high-temperature tempering, repeated hardening and low-temperature tempering. The repeated heat treatment imparts to the steel specimens, after processing on metal-working machines, the same degree of strength and increased the ductility as obtained during the thermomechanical treatment. In this way it is possible to apply this treatment to many steel grades at the rolling shop, in the last stage of hot rolling. After high-temperature tempering the metal can be subjected to mechanical processing and subsequently to a final heat treatment in the engineering plants. It was found that the heat treatment requires rapid heating. A preliminary cold deformation of the 65G steel grade prior to hardening and tempering results in greater strength than if no workhardening is applied. The mechanical

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characteristics of 65G steel grade, after the four heat treatment schedules given above were the following:

кн	σ_B, кг/мм²	σ_s, кг/мм²	δ_5, %	ψ, %
I	77,6—78,1	45,8—47,9	19,1—17,6	57—54
II	81,6—78,0—84,1	53,5—54,0—66,1	14,6—13,7—13,0	54—53—49
III	84,7—85,5	65,4—66,4	13,2—13,0	50,4—49,5
IV	85,2—89	72,3—74,7	13,0—12,7	49,7—48,4

The fact that the effect of workhardening is maintained and transferred in the 65G grade steel after hardening and high-temperature tempering was also apparent from x-ray structural analyses of the fine-grained structure of specimens subjected to the four versions of heat treatment. They showed a considerable physical widening of the diffraction lines in specimens which were workhardened. There is 1 table.

S/129/62/000/006/005/008
E073/E435

AUTHORS: Chudnovskaya, L.A., Candidate of Technical Sciences,
Bernshteyn, M.L., Candidate of Technical Sciences,
Shevyakova, L.G., Engineer

TITLE: Thermomagnetic and thermomechanical-magnetic treatment of tool steels

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no.6, 1962, 36-39

TEXT: The influence of these treatments on the mechanical properties of steels ХВГ (KhVG) and Р18 (R18) was studied. The thermomagnetic treatment consisted of: 1) quenching austenized specimens in an oil tank placed between the poles of an electromagnet which produced fields up to 5000 Oe or in a tank placed inside a solenoid which produced an alternating field of up to 1200 Oe; 2) applying an electric field to the specimen during the entire process of tempering, i.e. during heating up, holding and cooling. Thermomechanical-magnetic treatment: specimens of R18 steel, 20 mm long, 1.2 mm diameter, were heated to the quenching temperature and then air-cooled inside a magnetic field of up to
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2000 Oe. The results indicate that application of a magnetic field accelerates the austenite to martensite transformation and in some cases brings about the formation of a crystallographic texture. Thermomagnetically treated specimens of KhVG steel tempered at 175°C with the application of an alternating magnetic field had bending strength values over 300 kg/mm^2, i.e. higher than for specimens tempered without the use of a magnetic field. The strength of specimens of R18 steel was about 20% higher after thermomechanical (5% deformation)-magnetic treatment than after ordinary heat treatment. The average breaking torque of a 7 mm twist drill (after the usual hardening and tempering) in an a.c. magnetic field was 1610 kg/mm^2 as compared with 1250 kg/mm^2 for an equal twist drill subjected to treble tempering at 560°C for one hour without applying a magnetic field; the wear resistance was about 15% higher. There are 4 figures.

ASSOCIATIONS: VNII
Moskovskiy institut stali (Moscow Steel Institute)

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S/659/62/009/000/019/030
I003/I203

AUTHORS: Demina, E. L., Tai T'ung-fu and Bernshteyn, M. L.

TITLE: The influence of cold-working and of alloying on the crystal structure and on the properties of nickel-base heat resisting alloys

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam v. 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 139–145

TEXT: The alloys investigated were quenched from 1000–1200°C, and drawn to a 5.25% and 75% deformation. Hardness, red-hardness, the mosaic structure and internal friction were determined. It was concluded from the data that internal friction increases with increase in the degree of cold-working, and that slip is easier along the block boundaries when the samples with a high degree of cold-work deformation are heated, this is due to dislocation movements caused by the heat and applied stress. The investigation on the effect of alloying with chromium, molybdenum and tungsten shows that there is little strengthening of the solid solution except when the alloying elements present cause lattice imperfections by the formation of a strengthening phase on aging. There are 4 figures and 1 table.

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and thermomechanical magnetic working

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. . . . movable part to the scale was 1650 mm. The optical system

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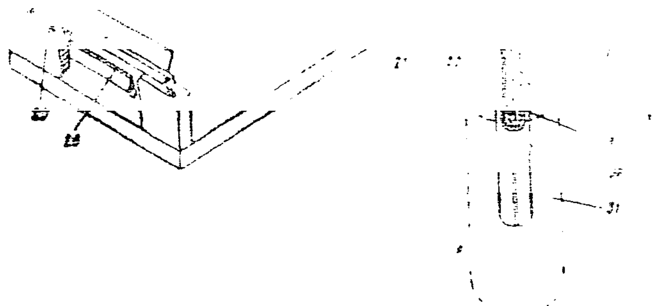

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S/126/63/015/001/010/029
E111/E183

AUTHORS: Bernshteyn, M.L., and Shtremel', M.A.

TITLE: The "hereditary" influence of work hardening on the properties of steel

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.1, 1963, 82-90

TEXT: Cold plastic deformation often produces effects on the properties of steel which survive several phase recrystallisations. This could account for the scatter of test results characteristic of batches of industrial steels. A study of the effect of preliminary work hardening on the tendency to temper brittleness of type 40ХН (40KhN) steels with additions of Mo, W, Al and B showed that some effects persisted through a series of $\alpha \rightarrow \gamma \rightarrow \alpha$ changes, and that work hardening of steel in the austenitic state had a particularly marked effect on the temper brittleness after hardening, on strength, and on fine structure of the steel. Thermo-mechanically treated steels show persistent "inherited" effects, for which the following specific features of structure and transformation mechanisms in this treatment are responsible:

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1) Work hardening reduces grain size, the fine grains generally surviving $\alpha \rightarrow \gamma$ transformation unless collective recrystallisation can occur. 2) The texture produced by work hardening makes some properties anisotropic. 3) In addition to this "crystallographic" texture there is a "dislocation" texture (non-uniform distribution of dislocations between crystallographically possible slip systems in each crystallite, and also relative to the polycrystal as a whole). 4) Finally, there is a "precipitate" texture which can arise if the symmetry of form or lattice of the precipitates is lower than that of the matrix; this can lead to "inherited" effects e.g. in alloy steel where non-uniform distribution of carbon and alloying elements persists for a long time after the formation of austenite, promoting the restoration of the "precipitate" texture after hardening. There are 6 figures and 5 tables.

ASSOCIATION: Moskovskiy institut stali i splavov
(Moscow Institute of Steel and Alloys)

SUBMITTED: August 5, 1962 (initially);
April 13, 1962 (after revision).

S/129/63/000/004/002/014
A004/A127

AUTHORS: Bernshteyn, M.L., Cherepanova, G.I., Ryzhak, S.S.

TITLE: High-temperature thermomechanical treatment of type X8 (Kh8) alloys

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no. 4, 1963, 5 - 8

TEXT: The authors carried out tests with the OX8 (OKh8), 27X8 (27Kh8) and 47X8 (47Kh8) alloys to study the effect of high-temperature thermomechanical treatment on these alloys. It was found that high-temperature thermomechanical treatment of these alloys results in a stable strengthening which is maintained even after a phase recrystallization with rapid heating, i.e., the investigated alloys showed a reversibility effect of thermomechanical treatment. The amount of latent energy accumulated in the high-temperature thermomechanical treatment process exceeds that absorbed in cold deformation by a factor of 1.5 - 2. Recrystallization in the initial stages does not fully remove the strengthening effect of high-temperature thermomechanical treatment, which increases the softening

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A004/A127

High-temperature thermomechanical ...

temperature. There are 7 figures and 2 tables.

ASSOCIATION: Moskovskiy institut stali i splavov (Moscow Institute of Steels and Alloys)

Card 2/2

S/126/63/015/001/010/029
E111/E183

AUTHORS: Bernshteyn, M.L., and Shtremel', M.A.

TITLE: The "hereditary" influence of work hardening on the properties of steel

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.1, 1963, 82-90

TEXT: Cold plastic deformation often produces effects on the properties of steel which survive several phase recrystallisations. This could account for the scatter of test results characteristic of batches of industrial steels. A study of the effect of preliminary work hardening on the tendency to temper brittleness of type 40XH (40KhN) steels with additions of Mo, W, Al and B showed that some effects persisted through a series of $\alpha \rightarrow \gamma \rightarrow \alpha$ changes, and that work hardening of steel in the austenitic state had a particularly marked effect on the temper brittleness after hardening, on strength, and on fine structure of the steel. Thermo-mechanically treated steels show persistent "inherited" effects, for which the following specific features of structure and transformation mechanisms in this treatment are responsible:

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The "hereditary" inflience of work ... S/126/63/015/001/010/029
E111/E183

1) Work hardening reduces grain size, the fine grains generally surviving $\alpha \rightarrow \gamma$ transformation unless collective recrystallisation can occur. 2) The texture produced by work hardening makes some properties anisotropic. 3) In addition to this "crystallographic" texture there is a "dislocation" texture (non-uniform distribution of dislocations between crystallographically possible slip systems in each crystallite, and also relative to the polycrystal as a whole). 4) Finally, there is a "precipitate" texture which can arise if the symmetry of form or lattice of the precipitates is lower than that of the matrix; this can lead to "inherited" effects e.g. in alloy steel where non-uniform distribution of carbon and alloying elements persists for a long time after the formation of austenite, promoting the restoration of the "precipitate" texture after hardening. There are 6 figures and 5 tables.

ASSOCIATION: Moskovskiy institut stali i splavov
(Moscow Institute of Steel and Alloys)

SUBMITTED: August 5, 1962 (initially);
April 13, 1962 (after revision).

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