L 22975-66
ACC NR: AT6008655

plastic specimens. The machine is designed for shear, tension, and compression testing in conditions of automatic programmed one-sided heating of specimens up to 1300K with a temperature increase rate of up to 50° per second in air and in an enclosed gas medium. A movable electric oven open on one side is used for maintaining the programmed temperature. Regulation of the specimen temperature is effected by automatically varying the distance between the oven and the specimen surface. The construction and the methods of conducting tests with the IMASh-11 machine are described by M. G. Lozinskiy and G. Ye. Vishnevskiy (Ustroystvo dlya izucheniya zakonomernostey deformatsii i razrusheniya obratsov, Byulleten' izobreteniy, 1963, No. 9). The authors describe the conduct and results of tests performed to measure the variation of the strength of sheet specimens of glass plastics AG-4S and EF-S with the level of initial constant stress. Strength and durability characteristics of the materials were measured in conditions of tension, compression, and shear. The IMASh-11 machine is shown in a schematic diagram, and a photograph shows the mounting of an RFK-1 camera used in recording shear deflections. Orig. art. has: 4 tables, 6 figures, and 1 photograph.
SUB CODE: 11/ SUBM DATE: 19Aug65/ ORIG REF: 007

Card 2/2 Le

LOZINSKIY, M. G.

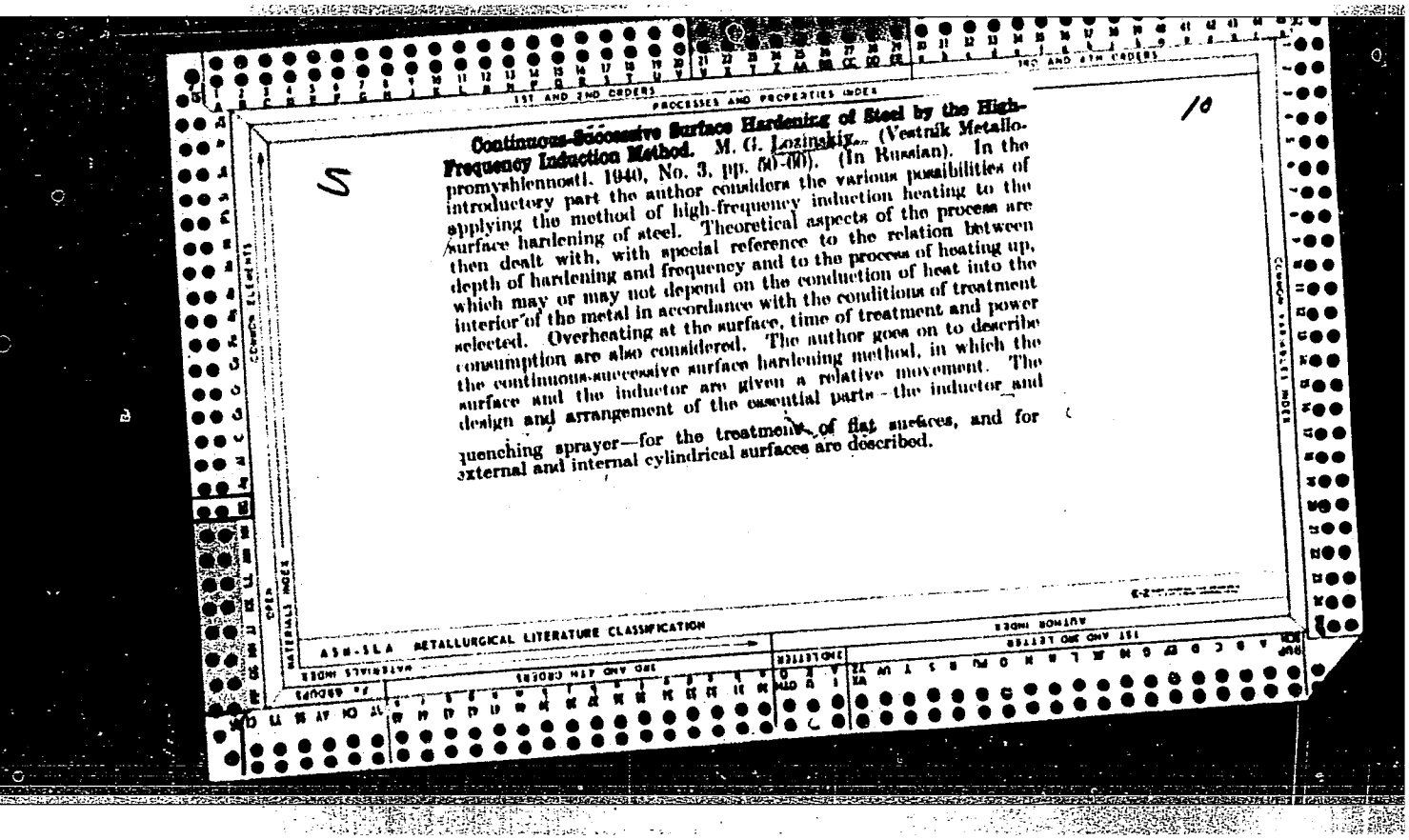
"Surface Hardening of Tools with High Frequency Currents", Stanki i Instrument 10, Nos. 6 1939, Leningrad Svetlana Plant, Engineer.

Report U-1505, 4 Oct 1951.

LOZINSKIY, M. G., Engineer

Leningrad Svetlana Plant. "High Frequency Electro-Thermic Treatment," Stanki i Instrument, 10, Nos. 10-11, 1939.

Report U-1505, 4 Oct 1951.



PROCESSES AND PROPERTIES INDEX

S

10

Continuous-Successive Surface Hardening of Steel by the High-Frequency Induction Method. M. G. Lozinskiy. (Vestnik Metallopromyshlennosti, 1940, No. 3, pp. 50-60). (In Russian). In the introductory part the author considers the various possibilities of applying the method of high-frequency induction heating to the surface hardening of steel. Theoretical aspects of the process are then dealt with, with special reference to the relation between depth of hardening and frequency and to the process of heating up, which may or may not depend on the conduction of heat into the interior of the metal in accordance with the conditions of treatment selected. Overheating at the surface, time of treatment and power consumption are also considered. The author goes on to describe the continuous-successive surface hardening method, in which the surface and the inductor are given a relative movement. The design and arrangement of the essential parts - the inductor and quenching sprayer—for the treatment of flat surfaces, and for external and internal cylindrical surfaces are described.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

LOZINSKIY, M. G.

"Brazing Super-Hard Alloy Blades on Cutters by Heating with High Frequency Current", Stanki I Instrument, 14, No. 1-2, 1943.

BR-52059019

LOZINSKIY, M. G.

Inst. Metallurgy, Acad. Sci., SSSR (-1946-)

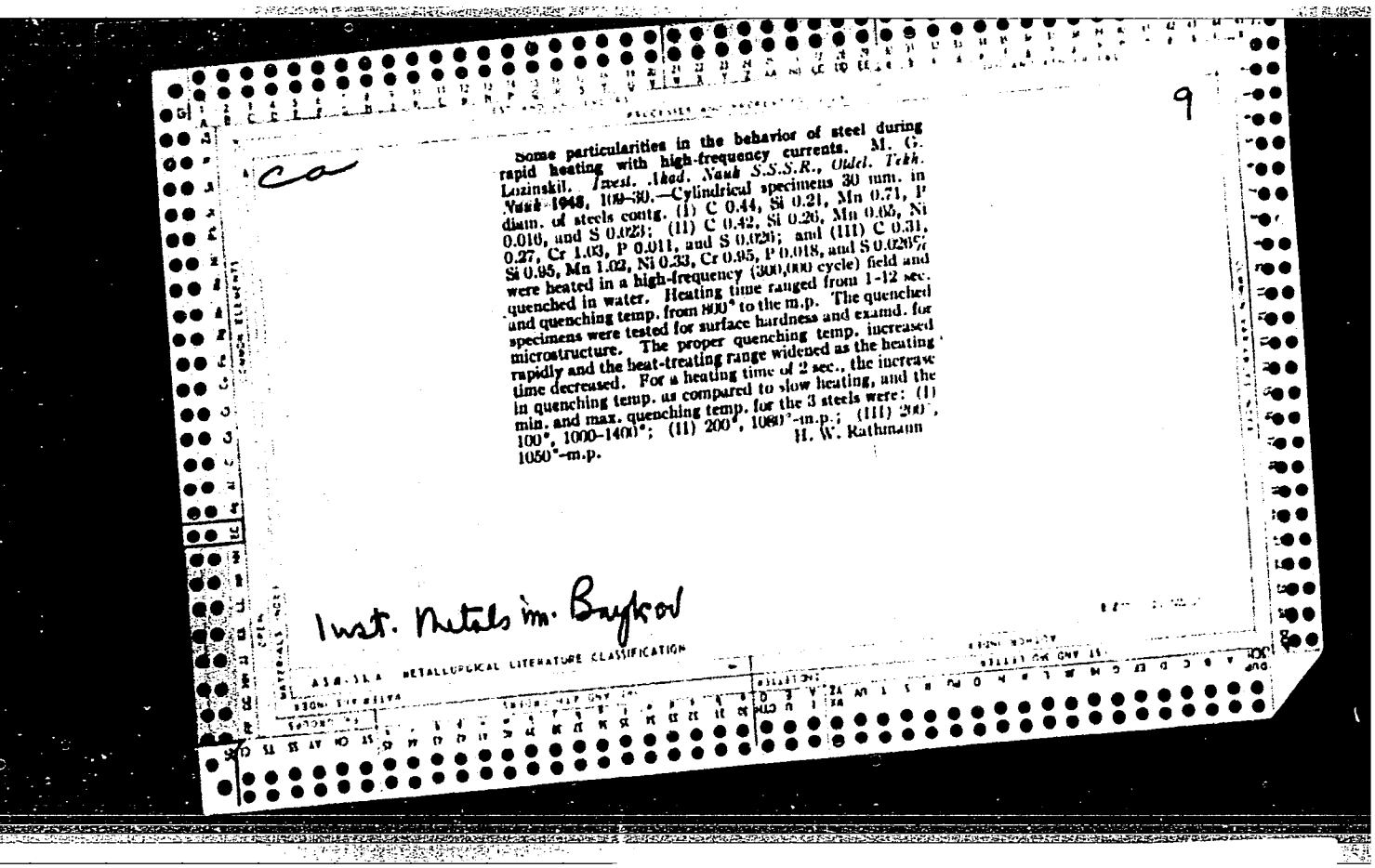
"A New Method of Surface Hardening of Steel with High-Frequency Induction Heating Under W Water."

Iz. Ak. Nauk, Otdel Tekh. Nauk, No. 4, 1946

LOZINSKIY, M.G., laureat Stalinskoy premii.

High-frequency soldering in machine building. Vest.mash.27 no.3:57-61 '47. (MLRA 9:4)

1.Institut metallurgii imeni A.A.Baykova, AN SSSR.
(Solder and soldering)



9

Ca

Some particularities in the behavior of steel during rapid heating with high-frequency currents. M. G. Lozinskii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk* 1948, 109–30.—Cylindrical specimens 30 mm. in diam. of steels contg. (I) C 0.44, Si 0.21, Mn 0.71, P 0.010, and S 0.023; (II) C 0.42, Si 0.20, Mn 0.65, Ni 0.27, Cr 1.03, P 0.011, and S 0.020; and (III) C 0.31, Si 0.95, Mn 1.02, Ni 0.33, Cr 0.95, P 0.018, and S 0.020% were heated in a high-frequency (300,000 cycle) field and quenched in water. Heating time ranged from 1–12 sec. and quenching temp. from 800° to the m.p. The quenched specimens were tested for surface hardness and examd. for microstructure. The proper quenching temp. increased rapidly and the heat-treating range widened as the heating time decreased. For a heating time of 2 sec., the increase in quenching temp. as compared to slow heating, and the min. and max. quenching temp. for the 3 steels were: (I) 100°, 1000–1400°; (II) 200°, 1080°-m.p.; (III) 200°, 1050°-m.p.

H. W. Rathmann

Inst. Metals im. Baykov

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION

LOZINSKIY, M. G. ed.

Osnovy teorii i praktika skvoznogo induktsion nogo nagreva dlia goriachei shtampocki i kovki. (Vestn. Mash., 1948, no. 5, p. 28-42)

(Fundamentals of the theory and practice of through induction heating for swaging and drop forging.)

DLC: TN4.V4

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

LOZINSKIY, M. G.

PA 20/49T19

USSR/Electricity
Thermoelectricity
Generators, Vacuum Tube

Dec 48

"Generator Building for Industrial High-Frequency Electrothermy," M. G. Lozinskiy, Cand Tech Sci, Inst of Metal imeni Baukov, Acad Sci USSR, 13 pp

"Elektrichestvo" No 12

Reports method of approximate determination of parameters of high-frequency generators during various types of heating of materials in a quickly varying electromagnetic pole, in connection with technical characteristics of modern machines, ion and tube

[redacted] 20/49T19

USSR/Electricity (Contd)

Dec 48

generators of increased and high-frequency. Describes improvements of these aggregates. Supplements information in article, "Unification of High-Frequency Installations," by D. V. Mondrus, S. M. Margolina, and V. M. Zil'berman, Engineers, published in "Elektrichestvo" No 4, 1948 (69T27).

[redacted] 20/49T19

LOZINSKIY, M. G.

PA 37/49T13

USSR/Electricity
Heating, Electric
Electrical Equipment

Sep 48

"Conference on Types of Electric Equipment Installations for High-Frequency Heating," M. G. Lozinskiy, Laureate of Stalin Prize, 1 p

"Vest Mashinostroy" Vol XXVIII, No 9

Summarizes proceedings at conference held in Leningrad in Jun 48. Two tables show characteristics of various installations.

37/49T13

LOZINSKIĬ, M.G.

Case hardening and induction heating of steel. Moskva, Gos. nauch.-tekhn. izd-vo mashinostroit. lit-ry, 1949. 459 p. (50-15758)

TN750.L6

LOZINSKII, M. G.

Lozinskiy, M. G., "Some Regularities in the Deformation of Steel Parts Caused by Alternate Heating and Cooling." Vestnik Inzhenerovi Tekhnikov, No 6, 1949.

LOZINSKIY, M. G. ed.

Elektronagrev zagotovok dlia kovki i shtampovki; tekhnologiia, rezhimy, osnashchenie; sbornik. Moskva, Mashgiz, 1950. 190 p. illus.

Includes bibliographies.

(Electric heating of bars for forging and punching; technology, operating conditions, equipment; symposium.)

DLC: TS253.L7

SO: Manufacturing and Mechanical Engineering in the Soviet Union, Library of Congress, 1953.

LOZINSKII, M. G.

GUDTSOV, N.T., LOZINSKII, M.G., ZUDIN, I.F., BOGDANOV, A., and MATVEEVA, M.P.

C.A. Vol. 45, 8955 d

"Properties of Metals and Alloys at High Temperatures in Vacuo." N.T. Gudtsov, M. G. Lozinskii, I. F. Zudin, N.A. Bogdanov, and M.P. Matveeva. Izvest. Akad. Nauk S.S.S.R., Otdel, Tekh. Nauk 1950, 108-25

App. is described for heating polished steel specimens of 25 sq. mm. cross-sect area up to the m.p. in vacuo (10^{-6} mm. Hg) and etching at the desired temp. by admitting Cl, HCl, HNO_3, N oxides, or air to several mm. Hg pressure. Heating is accomplished by passing elec. current through the specimen, and the temp. is detd. by thermocouples welded to the specimen. Above 900° the specimens are etched in vacuo because of the varying rate of vaporization of the phases and impurities present. Special attachments permit measurement of Vickers hardness at temp. up to 900° and of the rate of vaporization of the metal.

Translation W-16673, 2 Feb 51

LOZINSKIY, M. G.

USSR/Metals - Stress
Metallography

Jan 50

"Problem of Investigating the Properties of Metals and Alloys at High Temperatures in Vacuo," Acad N. T. Gudtsov, M. G. Lozinskiy, I. F. Zudin, N. A. Bogdanov, M. P. Matveyeva, Inst of Metal imeni A. A. Baykov, Acad Sci USSR, 17pp

"Iz Ak Nauk SSSR, Otdel Tekh Nauk" No 1

Completely describes apparatur (consisting of ordinary large glass bell jar, vacuum pump, and electrical connections) for studying in vacuo behavior of metal samples under tension and compression at high temperatures. Describes operating techniques. Meters and dials inside and outside the jaw show tensions applied to samples by lever arms, etc. Submitted 8 Jun 49.

P A 161T104

Heat Treatment Furnaces

J. of the I. & S. I.

On the Problem of Choosing Optimum Conditions for the High-Frequency Heating of Steel. M. G. Lozinskii. (*Stanki i Instrument*, 1950, No. 7, 13–16). [In Russian]. A critical review is made of the main features of the induction heating of steel. After considering the nature of the process of induction hardening, the influence of the electrical conditions on the nature of the temperature distribution across a section of the work is discussed. Experiments on the connection between the heating temperature and the residual stresses are briefly described. a. a.

LOZINSKIY, M. G.

PA 163T47

USSR/Metallurgy - Furnaces, Induction Smelting — Jul 50

"High-Frequency Induction Furnaces for Metal Smelting in a Vacuum and in a Gaseous Medium," M. G. Lozinskiy, Cand Tech Sci, Stalin Prize Laureate, Metallurgical Inst imeni A. A. Baykov, Acad Sci USSR

"Vest Mashinostroy" No 7, pp 47-53

Discribes type VVP-II hf induction furnace for laboratory and industrial use, charge capacity 5 kg, manufactured by "Platinopribor" Plant. Furnace designed to permit following operations under vacuum or protective gaseous medium: addition of alloying agents, measuring temperature of metals in liquid state and during crystallization, removal of slag, and stirring liquid metal. Set includes GL-30 hf generator (20 kw, 220/380 v, 50 cp, 6,600 v secondary to gaseous rectifier, G-431 oscillator tube operating at 250 kc), VN-1 rotary oil pump produced by Moscow Plant imeni Il'ich, and either glass McLeod gauge or thermocouple vacuum meter using LT-2 tube

produced by Moscow Elec Lamp Plant. Claims furnace will help develop new alloys and facilitate metallurgical research.

[redacted]

163T47

LOZINSKIY, M. G. FDD PA 169T50

USSR/Metals - Metallography Sep 50

"Colored Vacuum Etching of Metal Microsections at High Temperatures," N. T. Gudtsov, M. G. Lozinskiy, Inst of Metallurgy, Acad Sci USSR.

"Zavod Lab" Vol XVI, No 9, pp 1072-1073.

Describes apparatus and procedure for studying structure of metals and alloys at high temperatures by heating polished metallographic specimens in vacuum. Insta lation permits reaching temperature up to 1,200°. Vacuum of 10-5 mm Hg may be attained. Coloration of sections is explained by action on heated specimen surface of oxygen molecules still present in small quantity under vacuum conditions. Difference in coloration of various parts of specimens is result of variety in chemical activity related to anisotropy of grains.

PA 169T50.

LOZINSKIY, M. G. 176T87

USSR/Metals - Alloys 1 Aug 50

"Problem of Studying the Initial Stages of Melting in Complex Metallic Systems," Acad N. T. Gudtsov, M. G. Lozinskiy, Metallurgical Inst imeni A. A. Baykov, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXIII, No 4, pp 689-692

Describes new app for testing at high temp complex alloys under vacuum (10^{-5} mm/Hg). Consists of large bell jar and elec circuit for heating samples up to 1350° with speed of 100°C/min. With it one can now observe initial formation of austenite grains in melt and initial stages of crystn. High-temp heating of samples has been greatly accelerated. Submitted 9 Apr 50.

PA 176T87

LOZINSKIY, M.G.

Jun 52

USSR/Metals - Metallography

"Present State and Methods of Development of Vacuum Metallography," N. T. Gudtsov, M. G. Lozinskiy

"Zhur Tekh Fiz" Vol XXII, No 6, pp 905-920

Metal samples were heated in vacuum using either electrocontact method or heat transfer by irradiation. Microscopic study of microstructure was performed and hardness of material tested. Describes equipment used. Received 15 Jul 51.

219T50

LOZINSKIY, M. G.

USSR/Metallurgy - Aging Aug 52

"Study of the Aging of Metals and Alloys by Measuring the Hardness During Heating in Vacuum," N. T. Gudtsov, M. G. Lozinskiy, Inst of Mach Constr, Acad Sci USSR.

"Zhur Tekh Fiz" Vol 22, No 8, pp 1249-1255

States subject is important for service life of mach parts operating at high temp. The authors constructed equipment and devised methods of study (cf. N. T. Gudtsov, et al. "Iz Ak Nauk SSSR,

226T39

Otdel Tekh Nauk" 1, 108, 1950, and "Dok Ak Nauk SSSR" 73, 94, 689, 1950) In current article subject is analyzed by study of change of hardness under isothermal conditions in vacuum and curves are plotted in coordinates of hardness, temp, and time. Received 1 Jan 52.

226T39

LOZINSKIY, M.G.

Some design characteristics of high-frequency vacuum furnaces of small capacity. [Izdaniia] LONITOMASH no.30:140-150 '52.(MLRA 8:1)
(Electric furnaces)

USSR/Metallurgy - Steel, Structures 1 Jan 52

"Concerning Migration of Austenite Grain Boundaries," M. G. Lozinskiy, Inst of Mach Studies, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 82, No 1, pp 53-56

Describes equipment and method for studying migration kinetics of austenite grain boundaries in steel, using successive short soaking periods at

230T33

1,000-1,200° and 1,250-1,350° in vacuo with residual pressure about 1.10^{-5} mm. States that method broadens possibilities for metallographic investigations, especially in studying structure of heat-resistant materials under heating to high temps. Submitted by Acad N. T. Gudtsov.

230T33

LOZINSKIY, M. G.

LOZINSKIY, M.G.

USSR/Metals - Steel, Structural Analysis 1 May 52

"Methods for Studying the Variations in Hardness of Alpha- and Beta-Phases of Steel During Heating to 1,100° in Vacuo," M. G. Lozinskiy, Inst of Mach Studies, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXXIV, No 1, pp 63-66

Describes expts for establishing regularity in hardness changes of low-carbon steel during its heating from room temp to 1,100°, showing, for the 1st time, character of hardness variation within temp range of phase transformations. Describes special testing installation and presents results in form of temp-hardness diagram. Submitted by Acad N. T. Gudtsov 9 Feb 52. 224T63

LOZINSKY, M. G.

Metallurgical Abst.
Vol. 21 May 19[illegible]
Structure

Decorating the Structure of Grains of Metal at High Temperature. V. A. Oding and M. G. Lozinsky (*Doklady Akad. Nauk S.S.S.R.*, 1952, 86, (4), 707–709). [In Russian].
To investigate the internal structure of the grains, plate specimens (60 × 10 × 3 mm.) of pure metals, ground and polished on one surface, were heated in a vacuum of 10^{-4} to 10^{-5} mm. Hg, by passing 50 c./s. A.C. through them for periods of from a few min. to some hr. Up to 1400° C. the temp. was measured with a thermocouple spot-welded to the specimen surface; higher temp. were deduced from the elect. resistance of the specimen. As a result of selective evaporation, the grain boundaries of the prepared surface were clearly visible (cf. L., *ibid.*, 1952, 82, 53; *M.A.*, 21, 790). After heating at temp. of 0·8–0·75 T, where T is the m.p., the grains had a laminated structure. If the grains be assumed to be made up of flat mosaic blocks, ~10^2–10^3 lattice parameters (a) thick, then this structure can be attributed to variations in the intensity of evaporation, owing to differences in the bond energies. Photomicrographs of this structure are given for W heated for 15 min. at 2000° C., and Mo heated at 1450° C. for 20 min., the thickness of the mosaic block being ~400 and ~500 a, resp., with some variation for individual blocks in a grain. Length was much greater than thickness. The blocks are bent near the grain boundaries, which may indicate that the strength at the grain boundary differs from that in the grain, for pure metals. Various explanations are given for the slightly different orientation of the blocks observed in 0·45% C steel heated at 1100° C. for 11 hr. (block thickness 400–1500 a).—G. V. E. T.

LOZINSKIY, M.G.

Chemical Abst.
Vol. 48 No. 4
Feb. 25, 1954
Metallurgy and Metallography

Structure of austenite at high temperature. L. A. Oding and M. G. Lozinskii. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk* 1953, 1035–43.—Austenite is exaind. at 1300° under high vacuum and the app. used is described. After being heated to high temp. austenite develops flat blocks in its grains and increases in chem. heterogeneity of the grains, which leads to a peculiar dendritic pattern or a martensite pattern on the surface of a polished sample. The effect varies somewhat with different grades of steel. The selectivity of vacuum evapn. of metals is exhibited not only in a locally geometric sense, but also in a chem. sense, in that the various components of an alloy evap. at different rates and alter the compn. G. M. Kosolapoff

LOZINSKII, M. G.

A new mechanism of plasticity of metallic solid solutions. K. A. Osipov, S. G. [illegible]ov, and M. G. Lozinskii (Inst. Machine Practice, Acad. Sci. U.S.S.R.). *Doklady Akad. Nauk S.S.S.R.* 89, 57-60(1953)(Engl. translation issued by *Natl. Sci. Foundation, Wash. D.C.* as NSF-tr-19, 5 pp. (June, 1953)).—Alloys in the α-solid soln. region of the Cu-Pb system contg. 2, 5, 8, and 12% Pb were melted and then annealed at 650–700° for 360 hrs. Cylindrical samples were prepd. and annealed *in vacuo* at 700° for 6 hrs. to remove work hardening. The hardness was detd. by impressing for 5 min. *in vacuo* a 4-sided diamond pyramid with a 1-kg. load. Each sample was tested for hardness at 20, 200, 350, 500, 600, 700, and 800°. All hardness indentations were heated to 800° then cooled and measured at room temp. Below 425–525°, depending on the compn., the log. of hardness is linear with temp. At higher temp. the log. of hardness drops sharply. The deviation from linearity coincides with changes in microstructure in the vicinity of the hardness indents. Below 425–525° slip bands were observed while at a higher temp. instead of slip bands the impressions were surrounded by many small cells considerably smaller than the original course grains. Two limiting hypotheses are: (a) there are no small cells in the original grains and they come into existence in the process of deformation; (b) the cells exist in the original grains and are revealed during deformation. The authors favor the latter hypothesis and cite as evidence the appearance of small grains within larger grains after prolonged electrolytic etching of a cast Ni-5 at. % Cr alloy annealed at 1250° for 10 hrs.

Don T. Cromer

C.A. V-48
Jan 10, 1954
Metallurgy & Metallography

3

Evaluation B-76505

LOZINSKIY, M. G.

USSR/Metallurgy - Steel, Structural Analysis Mar 53

"The Heterogeneity of Austenite," I. A. Oding, Corr Mem Acad Sci USSR; M. G. Lozinskiy, Inst of Machine Sci, Acad Sci USSR

DAN SSSR, Vol 89, No 2, pp 275-278

Discuss expts for revealing structure of steels by holding heated specimens in vacuum from few minutes to several hours at 1,200° in hottest zone. Increase in size of grains was usually observed with temp rise due to process of recrystallization. Grains grew also with increase of holding time.

246T51

Dissolving of old grains in larger new grains could be observed as is shown on micrographs presented. State that possibility of detg temp of complete dissolution of old grain boundaries inside new austenite grains is essential criterion for establishing optimum conditions of steel heat treatment. Also conclude that studying of intragranular liquation at high temps has great importance in evaluating expediency of steel alloying.

LOZINSKIY, M. G.

USSR/Metallurgy - Vacuum Method in Metallography, Grain Growth 1 Jul 53

"On the Shift of Grain Boundaries in Heated Metal," I. A. Oding, Corr Mem Acad Sci USSR; M. G. Lozinskiy, S. G. Fedotov; Inst of Machine Science, Acad Sci USSR

DAN SSSR, Vol 91, No 1, pp 75, 76

Presents results of investigations into kinetics of grain growth in steel and Sn-bronze during isothermal holding in vacuum chamber, showing

266T56

successive positions of growing grain boundaries on two micrographs. Discusses behavior of grain in growth process and calculates linear rate of boundary movement.

LOZINSKIY, Mikhail Girshevich

Academic degree of Doctor of Technical Sciences, based on his defense, 9 June 1954, in the Council of the Inst of Machine Science Acad Sci USSR, of his dissertation entitled: "New methods and apparatus for high-temperature research of the structure and properties of metals and alloys in a vacuum."

Academic degree and/or title: Doctor of Sciences

SO: Decisions of VAK, List no. 17, 9 Jul 55, Byulleten' MVO SSR, No. 17, Sept 56, Moscow, pp 9-16, Uncl. JPRS/NY-435

FD-1095

USSR/Engineering - Metallurgy

Card 1/1 Pub. 41-7/17

Author : Lozinskiy, M. G. and Fedotov, S. G.

Title : Changes in hardness of pure metals in heating

Periodical : Izv. AN SSSR. Otd. tekh, nauk 4, 80-85, Apr. 1954

Abstract : Describes experimental installation for hardness testing of metals during heating in vacuum up to 1,100°C and discusses results of experiments with following metals: pure aluminum, electrolytic copper, iron with 0.05% C, electrolytic nickel, pure cobalt, pure titanium, titanium with 1% impurities, and commercial molybdenum and tungsten. Diagrams, illustrations. 22 references including two American titles.

Institution :

Submitted : By I. A. Oding, Corr. Mb., AN USSR March 26, 1954

LOZINSKY, M. G.

62 "Some Results of Observations of the Microstructure of Metals and Alloys During Deformation by Tension at High Temperature. M. G. Lozinsky (*Izvest. Akad. Nauk S.S.S.R.*, 1954, [Tekhn.], (10), 3–13).—[In Russian]. A detailed description is given of an apparatus for observing changes in microstructure of metals and alloys subjected to tension at high temp. It consisted of a high-vacuum chamber in which the specimen under test was held between a fixed and an adjustable Cu jaw. The specimen was heated by passing a low-voltage current through it, and temp. up to ~1000° C. could be attained. Direct observation of a predetermined section of the surface is made possible by installation of a met. microscope provided with a ciné-camera. Photomicrographs of steel and high-purity Co specimens are reproduced and discussed. Steel specimens contg. 0·18% C, heated in vacuum at 950° C. for 30 min., showed well-defined austenite grains. Failure of the specimen at 1000° C. occurred along grain boundaries. The photographs showed an increase in the width of grain boundaries near the fracture zone. Co specimens subjected to tensile stresses at 400° C. showed a striped relief effect which disappeared on cooling. The appearance of this relief effect on the polished surface of α-Co was attributed chiefly to the anisotropic properties of the hexagonal Co lattice existing at temp. up to 477° C.—S. K. L.

*Corrosion and Structure. (Akimov). See col. 203.

USSR.

286/117 669.112.227.34

Certain Aspects of Austenite Transformations in the Martensite and Intermediate Zones

Izv. Akad. Nauk, Otd. Tekh./Nauk (11), 36-43 1954

M.G. Lozinsky U.S.S.R.

Installation is described which enables direct observation of steel surface which is thermally treated in a vacuum chamber. Microfilms obtained during tests of several standard steels are discussed in some detail. It is claimed that the new method enables direct study of austenite transformations in a much wider interval of temperatures than before. (Bibl. 9)

LOZINSKIY, M. G.

62

The Deformation Characteristics of Single-Crystal and Polycrystalline Copper at High Temperatures in Vacuum. M. G. Lozinsky and S. G. Fedotov (*Izvest. Akad. Nauk S.S.S.R.*, 1954, [Tekhn.], (12), 92–96).—[In Russian]. The Vickers microhardness of a Cu single crystal and of a specimen of remelted electrolytic Cu was determined in vacuum in the temp. range 20°–600° C. (cf. L. and F., *ibid.*, (4), 80; *M.A.*, 23, 71). Tests with diamond indenters were carried out on carefully annealed specimens by subjecting them to a load of 1 kg. for 1 min. The hardness/temp. relation for the single crystal was represented by a gradually and smoothly decreasing curve up to 700° C., where the decrease became more pronounced. In contrast, the curve for polycryst. Cu specimens showed a point of inflection at 500° C. Below 500° C. polycryst. Cu was harder than, between 500° and 800° C. less hard than, between 800° and 900° C. as hard as, a single Cu crystal. A study of microphotographs taken during and after the experiments revealed the cause of this behaviour of the hardness/temp. curve. The deformation in Cu single crystals proceeded up to 700° C. by the displacement mechanism and only above 700° C. at the boundaries of blocks of slightly different orientation, which became visible only at high temp. In polycryst. Cu, the deformation caused by indenters proceeds chiefly along the grain boundaries at temp. above 500° C.; hence the rapid lowering of hardness at that temp. Above 800° C., viscous flow began in both specimens.—S. K. L.

(1)

LOZINSKIY, M. G.

FD-1224

USSR/Physics-Carbon steel, hardness

Card 1/1 Pub. 153-8/22

Author : Lozinskiy, M. G. and Fedotov, S. G.

Title : Effect of carbon content on hardness of carbon steels at high temperatures

Periodical : Zhur. tekh. fiz. 24, 1609-1612, Sep. 1954

Abstract : Tests were carried out by the authors in order tc study the effect of carbon content in ordinary carbon steels on laws governing the variation of hardness in the range from room temperature to 800°. The applied methods are described. These are considered less expensive and less troublesome than those usually employed. Nineteen references including 2 foreign.

Institution :

Submitted : February 25, 1954

LOZINSKIY, M.G.

Chemical Abstracts
May 25, 1954
Metallurgy and Metallography

Evaluation B-79031

Methods for studying the structure of metals and alloys at high temperatures. I. A. Oding and M. G. Lozinskii. *Vestnik Mashinostroeniya* 34, No. 1, 52-61(1954).—Improved app. for heating metallurgical specimens in vacuum by radiation or by elec. resistance of samples are described, as well as the app. for studying thermal transformations for long periods at temps. up to 3000° under a microscope at 420 magnifications. In the latter, the I. A. Andin objective with a focal length of 15 mm. is used, and the deposition of vaporized material on the observation glass is prevented by interposing between it and the hot specimen a movable screen of Mo foil. Photomicrographs give the appearance of austenite heated between 1000 and 1340°. Grain growth occurs at 1150° and instantaneously, since it is not possible to see the gradual absorption of smaller grains by larger ones, after which grain size increases but much slower. Original grain boundaries, appearing as grooves, persist after recrystn. and disappear only at 1340°. Cooling austenite to 650° developed in it a relief image formed by a series of straight parallel lines never observed before and which, conceivably, might be similar in origin to martensitic transformations taking place on much faster cooling but assocd. with pronounced slippage phenomena during ferrite formation. Heating W wire contg. 0.05% Al to 3000° converted original elongated grains composed of many differently oriented smaller crystals into single grains of the same orientation, but widened grain boundaries about 3 times owing to the evapn. of impurities segregated in them. Photomicrocraphs of gray iron at 20, 900, 1000, and 1100° show the nonuniformity of austenite caused by increasing temp. and the grain growth assocd. with the formation of a solid soln. Color photomicrographs of heat-tinted Ni, Armco Fe, and a Cr-Mo alloy are given.

J. D. Gat.

LOZINSKIY, Mikhail Grigor'yevich, laureat Stalinskoy premii, doktor tekhnicheskikh nauk; ISLANKINA, T.F., redaktor; DMITRIYEVA, R.V. tekhnicheskiy redaktor.

[Industrial use of high-frequency induction heating] Promyshlennoe primenenie nagreva tokami vysokoi chastoty. Moskva, Izd-vo "Znanie," 1955. 39 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii, Seriia IV, no. 18.) (MLRA 8:8)
(Induction heating)

LOZINSKIY, M. G.

"Methods of Investigating the Structure of Metals and Alloys During High-Temperature Heating Under Vacuum." From the book, "Heat Treatment and Properties of Cast Steel." edited by N. S. Kreshchanovskiy, Moshgiz, Moscow 1955.

Lozinskiy, M.G.

USSR / Mechanical Properties of Crystals and Polycrystallic Compounds. E- 9

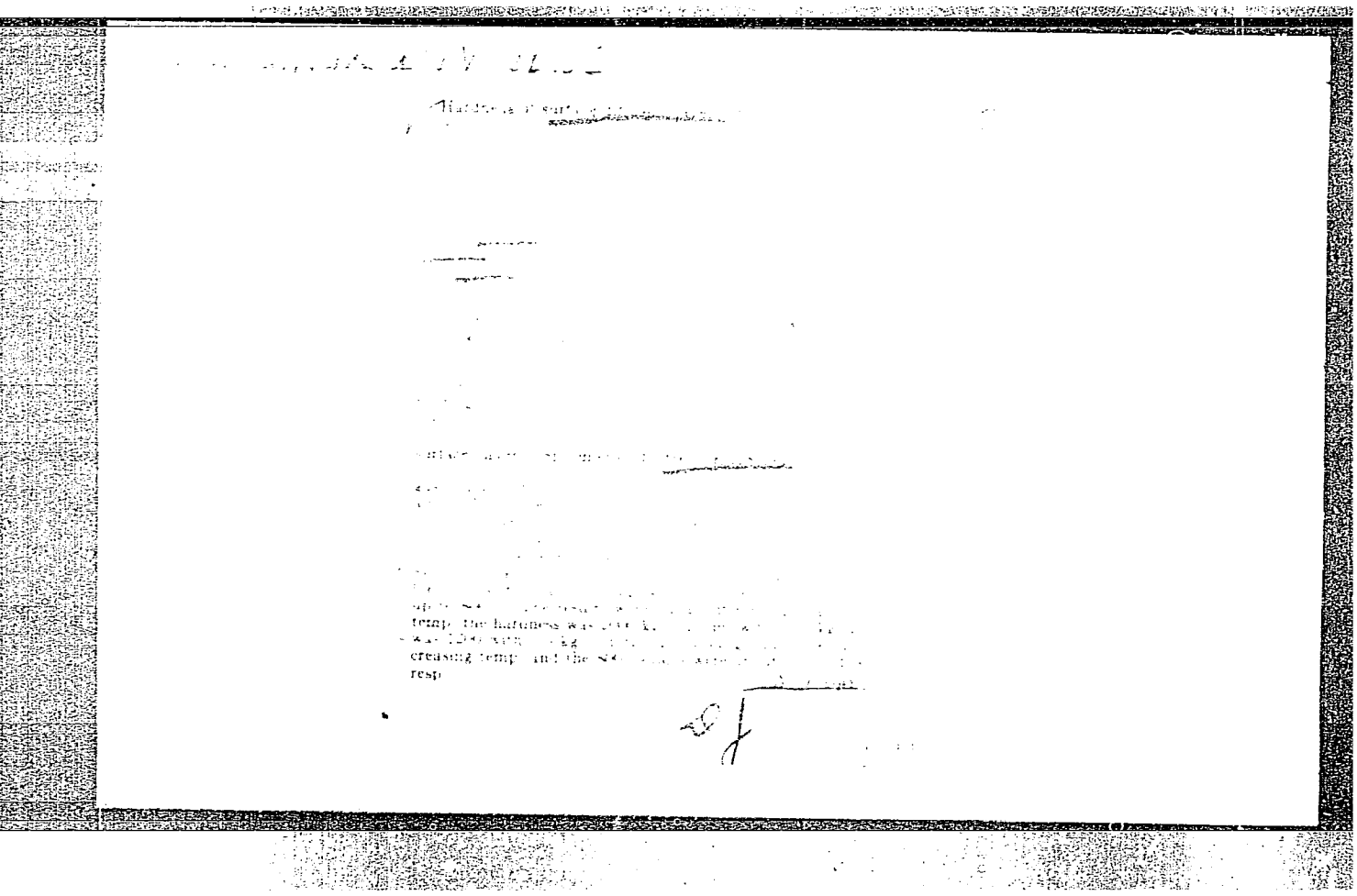
Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9412

Author : Lozinskiy, M.G.
Title : New Methods of Investigation of Processes of Deformation of Metals and Alloys at High Temperatures.

Orig Pub : Peredovaya tekhnologiya mashinostr. m., AN SSSR, 1955, 219-243

Abstract : Brief description of setups for the investigation of microstructure in properties of metals and alloys when heating and cooling in vacuum.

Card : 1/1



LOZINSKIY, Mikhail Grigor'yevich

Vysokotemperaturnaya Metallografiya. Moskva, Mashgiz, 1956.
311 p. illus., diagrs., tables.
Bibliography: p. 302-310.

LOZINSKIY, M. G.

Category : USSR/Solid State Physics - Phase Transformations in Solid Bodies E-5

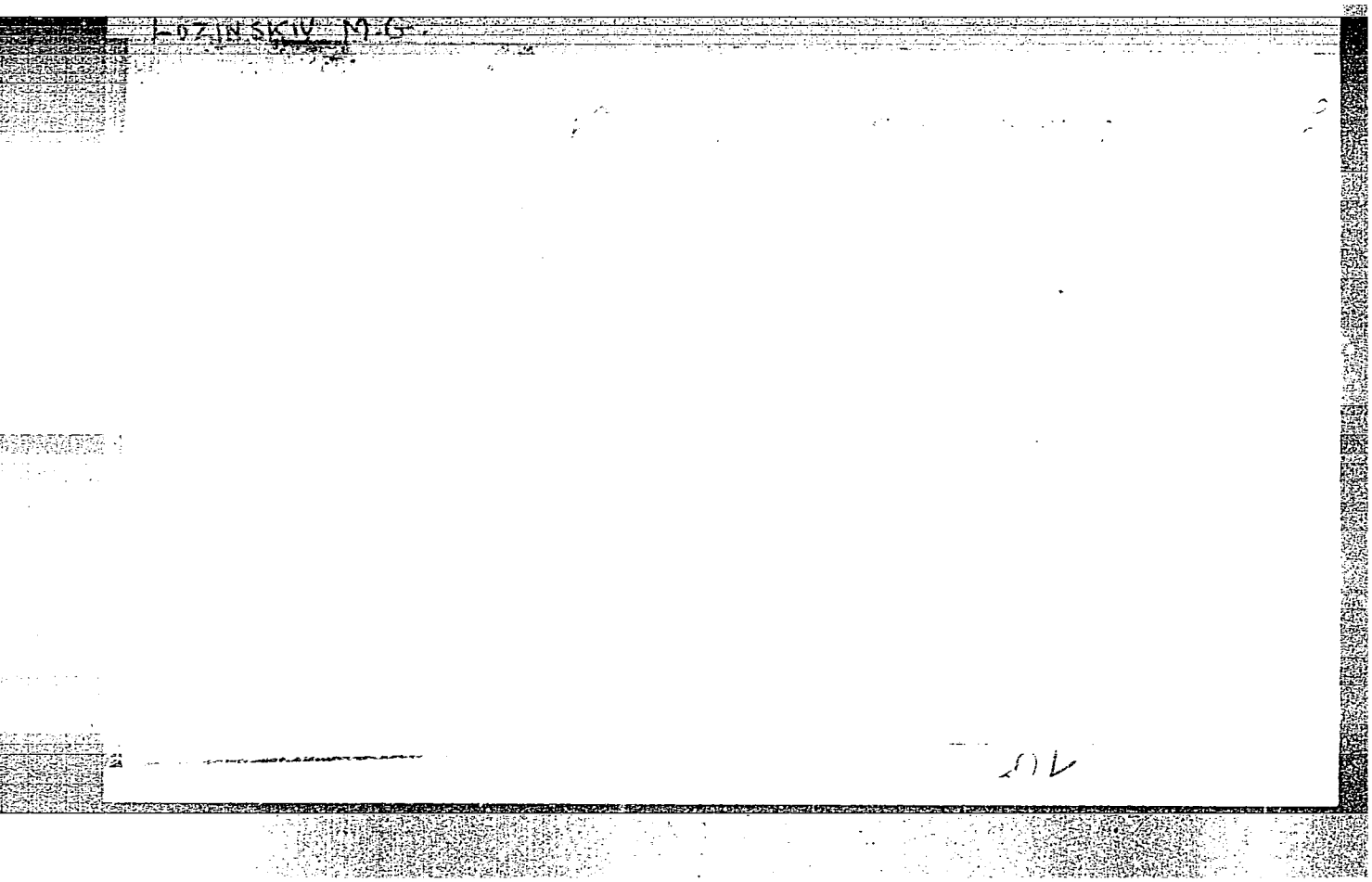
Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6608

Author : Lozinskiy, M.G.
Title : Apparatus and Method for the Study of the Structure and Properties of Metal and Alloys at High Temperature in Vacuum.

Orig Pub : Tr. Nauch.-tekhn. o-va chernoy metallurgii, 1955, 3, 171-227

Abstract : Report on a setup developed by the author of vacuum apparatus and a procedure for its utilization. Bibliography, 46 titles.

Card : 1/1



USSR/Engineering - Metallurgy

Card 1/1 Pub 41 - 7/16

Author : LOZINSKIY, M. G., and FEDOTOV, S. G., Moscow

Title : Peculiarities of the microstructures and the mechanism of hardness change of certain precious metals, when heated in a vacuum.

Periodical : Izv. AN SSSR, Otd. Tekh. Nauk 5, 109-113, May 1955

Abstract : Describes the experimental method and the results of heating samples of precious metals in a vacuum. The metals tested were: iridium, rhodium, platinum, palladium, gold and silver. The test samples were heated up to 2,000°C for iridium and 800°C for silver. Micro-photographs of the samples were taken during the heating process, and thus the grain structural changes were recorded. Hardness tests were also made during the heat treating process; the purpose of the experiment was to determine the hardness of these pure metals at high temperatures. Micro-photographs, graphs, tables. Eight references, 6 USSR.

Institution : Institute of Machine Science, Academy of Sciences USSR.

Submitted : April 4, 1955

LOZINSKIY, M. G.

Recrystallization of austenite at high temperatures. M. G. Lozinskii and S. I. Antipova. *Zavod. Lab.* 13, 825–31 (1955).—Equipment for high-temp. microscopic observation of steel specimens provided with a Mo screen for preventing [illegible] is described. [illegible] effect [illegible] of the components [illegible] and [illegible] austenite at raising temp. and under isothermal conditions for several steels is described and illustrated. [illegible]

Inst. Machine [illegible]

Lozinskiy, M. G.

USSR/ Engineering - Heat treating

Card 1/1 Pub. 128 - 13/28

Authors : Sharyy, A. Ya., Eng; Lozinskiy, M. G., Cand. of Mech. Sc.; Serensen, S. V., Active Mem., Acad. of Sc., Ukr. SSR.; and Garf, M. E., Cand. of Mech. Sc.

Title : Concerning the efficient heat treating of crankshafts for the DT-54 tractor diesel engines

Periodical : Vest. mash. 35/6, 56 - 60, Jun 1955

Abstract : During the period 1949-1951, of from 3-0.8% of all DT-54 diesel engines manufactured by the Stalingrad Tractor Plant, were rejected due to defects in engine crankshafts. Approximately 91.2% of these defects were caused by the breaking of crank webs and pins. For this reason, operational tests were conducted to determine the magnitude of torque, bending, dynamic load, and vibration factors in crankshaft operation, and to determine the influence efficiency of crankshafts. Three USSR references (1950-1955). Drawings; illustrations; graphs; table.

Institution : .....

Submitted : .....

JOZINSKIY, Mikhail Grigor'yevich, doktor tekhnicheskikh nauk; SHTEYNBOK, G.Yu., inzhener, vedushchiy redaktor; KHIMCHENKO, N.V., kandidat khimicheskikh nauk, redaktor

[New apparatus for studying microstructure and properties of metals and alloys at high temperatures] Novye pribory dlia issledovaniia mikrostruktury i svoistv metallov i splavov pri vysokikh temperaturakh. Tema 3, no.P-56-425. Moskva, Gostekhnika SSSR, 1956. 49 p. (MLRA 10:7)
(Metals at high temperature)
(Metallography)

LOZINSKIY, Mikhail Grigor'yevich, doktor tekhnicheskikh nauk; BELYAYEVA, G.F., kandidat tekhnicheskikh nauk, retsenzent; RAKHSHTADT, A.G., kandidat tekhnicheskikh nauk, redaktor; TIKHONOV, A.Ya., tekhnicheskiy redaktor

[High temperature metallography] Vysokotemperaturnaia metallografiia. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1956. 311 p. (MLRA 10:2)
(Metallography) (Metals at high temperatures)

LOZINSKIY, M.G.

137-58-3-5844

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 3, p 196 (USSR)

AUTHOR: Lozinskiy, M.G.

TITLE: Kinetics of $\beta \rightarrow \alpha$ Transformation in Iodide Titanium (Kinetika $\beta \rightarrow \alpha$ prevrashcheniya iodidnogo titana)

PERIODICAL: V sb.: Prochnost' metallov. Moscow, AN SSSR, 1956, pp 199-205

ABSTRACT: The $\beta \rightarrow \alpha$ transformation occurring in iodide Ti containing less than 0.01 percent of impurities was investigated by means of direct observation through a microscope of the formation of acicular contours on the polished surface of a specimen which was subjected to heating in vacuum. A description of the photographic methods and equipment employed is given. The direct observation and the taking of photographs were performed during the cooling of the specimen starting from the β range. Microphotographs of separate stages of the $\beta \rightarrow \alpha$ transformation are given and the kinetics of the process are discussed.

A. F.

Card 1/1

LOZINSKIY, M.G.

Category : USSR/Solid State Physics - Mechanical properties of crystals and polycrystalline compounds E-9

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1351

Author : Lozinskiy, M.G., Fedotov, S.G.
Title : On the Correlation Between the Compression Hardness and the Modulus of Normal Elasticity of Pure Metals at Higher Temperatures

Orig Pub : Izv. AN SSSR, Otd. tekhn. n., 1956, No 3, 59-67

Abstract : An investigation was made of the connection between the hardness of the metal as an index of resistance to plastic deformation, and the modulus of normal elasticity, as a characteristic of the elastic properties of the metal. The hardness was measured with thirteen pure metals heated to 1100° or to the melting temperature, using a vacuum setup constructed by the author. The values of E were calculated from the natural transverse oscillations at resonant frequency. The results were compared for 20, 500, and 800°. The result was that the data for most metals, when plotted in H_v -E coordinates, give a clearly pronounced linear relationship between the measured characteristics. Exceptions are W, Mo, Ti, Zr and Co, which display a sharp loss of strength upon a slight rise in temperature. At 800°,

Card : 1/2

Category : U$SR/Solid State Physics - Mechanical properties of crystals and poly- E-9
crystalline compounds

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1351

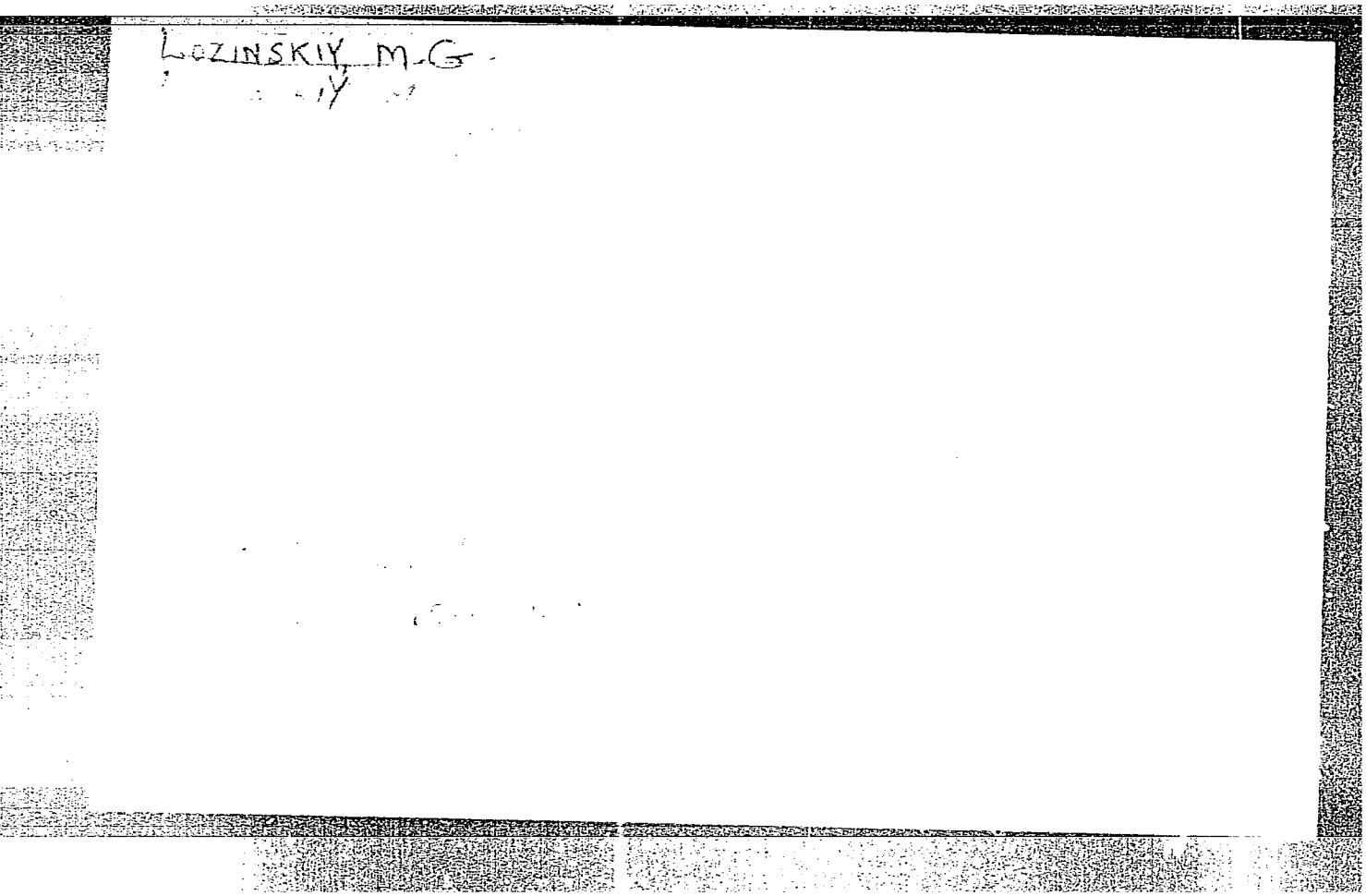
deviations from linearity are observed for metals in which viscous flow occurs along the grain boundaries when the hardness is measured. The authors believe that the principal role in the resistance to plastic deformation at increased temperatures is played by the strength of the interatomic bonds, characterized by the modulus of elasticity.

Card : 2/2

LOZINSKIY, M.G.; GUTERMAN, M.B.

Highly heat-resistant indenters for measuring the hardness of metals at temperatures up to 1300° in a vacuum. Zav.lab.no.11: 1358-1363 '56. (MLRA 10:2)

1. Institut mashinovedeniya Akademii nauk SSSR.
(Metals--Testing)



LOZINSKIY, M. G. and GUTERMAN, M. B.

"High Heat Stable Indentors for Measuring the Hardness of Metals When Heated to 1,300° in a Vacuum," by M. G. Lozinskiy and M. B. Guterman, Institute of Machine Science, Academy of Sciences USSR, Zavodskaya Laboratoriya, Vol 22, No 11, 1956, pp 1358-1363

Present methods used in measuring the hardness of metals and alloys are based on indentation. For extending the temperature range of the tests and increasing the longevity of the indentor tips it was necessary to find new materials capable of replacing the technical diamonds being used. As the result of many comparative tests, synthetic corundum (artificial sapphire) tips were found to be most suitable for measuring alloy hardness at temperatures up to 1,300°, under vacuum.

Schematic drawings of a diamond-tipped indentor and a sapphire-tipped indentor used in the tests are shown. Photomicrographs of the imprints of both type tips on test metals supplement the text.

Sum 1258

LOZINSKIY, M.G.

KIDIN, Ivan Nikolayevich; LOZINSKIY, M.G., redaktor; ROZENTSVEYG, Ya.D., redaktor izdatel'stva; MIKHAYLOVA, V.V., tekhnicheskiy redaktor

[Phase conversions during accelerated annealing of steel] Fazovy prevrashcheniia pri uskorennom nagreve stali. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1957. 92 p. (MLRA 10:9)
(Steel--Heat treatment)

LOZINSKIY, M.G.

UZHIK, Georgiy Viktorovich; LOZINSKIY, M.G., doktor tekhnicheskikh nauk, otvetstvennyy redaktor; KOPNOV, Ye.V., redaktor izdatel'stva; KASHINA, P.S., tekhnicheskiy redaktor

[Strength and plasticity of metals at low temperatures] Prochnost' i plastichnost' metallov pri nizkikh temperaturakh. Moskva, Izd-vo Akad. nauk SSSR, 1957. 191 p. (MLRA 10:5)
(Metals at low temperatures)

SOV/123-59-16-64509

Translation from: Referativnyy zhurnal. Mashinostroyeniye, 1959, Nr 16, p 122 (USSR)

AUTHOR: Lozinskiy, M.G.

TITLE: Problems of Strength at the Induction Heating of Steel

PERIODICAL: Sb.: Prom. primeneniye tokov vysokoy chastoty. Riga, 1957, 206 - 212

ABSTRACT: The possibility was investigated to increase the static strength of cylindrical parts by the local surface tempering of the areas of concentrated stresses, subjected to induction heating with high frequency currents. Samples of hardened steel of the 40Kh grade, which were provided with deep annular grooves, were exposed to induction heating with high frequency currents which warranted the local tempering of the surface layer near the grooves. As a result of such a treatment the breaking stress at the static tests of the samples increased by more than 2.5 times. The installation for carrying out the tests is described. 6 figures, 2 references.

K.S.M.

Card 1/1

SOV/137-58-10-21526

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 10, p 153 (USSR)

AUTHOR: Lozinskiy, M.G.

TITLE: Certain Peculiarities of Elastic and Plastic Deformation of Metals and Alloys Under Conditions of Heating and Stretching (Nekotoryye osobennosti uprugoy i plasticheskoy deformatsii metallov i splavov pri nagreve i rastyazhenii)

PERIODICAL: Dokl. 7-y Nauchn. konferentsii, posvyashch. 40 letiyu Velikoy Oktyabr'sk. sots. revolyutsii. Nr 2. Tomsk, Tomskiy un-t, 1957, pp 54-55

ABSTRACT: A presentation of results of a microscopic investigation of processes of elastic and plastic deformation (D) of metals and alloys under conditions of heating and stretching in vacuum. Experiments were carried out on apparatus of the IMASh-5 and IMASh-5M type equipped with devices for measuring the magnitude of D of specimens (S) under tension and capable of taking still and moving pictures of individual stages of D and destruction processes occurring in the same region on the surface of a S. It is shown that the formation of a micro-relief, which is observed on the polished surface of a pure Co S

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Certain Peculiarities of Elastic and Plastic Deformation

after it has been elongated and heated into the α region (477°C), is attributable to the elastic D of individual crystals. The micro-relief disappears completely when the S is cooled and relieved of its load. If the S is heated to higher temperatures and if greater tensile stresses are employed (greater than 6 kg/mm^2), the micro-relief is preserved even after cooling of the S; this indicates that slip D takes place under these conditions. During elongation of S's of low-alloy steel (0.03-0.45% C) and of steelof austenite class, different mechanisms of D and destruction were observed, depending on the temperature at which the experiments were carried out. At temperatures below the equicohesive point, the slip D and initial stages of destruction originate within the grains, whereas at temperatures above the equicohesive point the failure occurs along the grain boundaries. It is demonstrated that in many instances the microcracks formed on individual grain boundaries during a single heating cycle tend to "heal" during cooling, in the course of repetitive heating of an S to temperatures above the Ac_3 point, and do not reappear in the same region upon repeated heating. The phenomenon of "healing" is explained by the cohesive forces created when the walls of the microcracks come back into contact with each other. Local weakening of separate zones of steel S's, caused by multiple heating-cooling cycles in the range of phase-transformation temperatures, is explained by the action of thermal stresses. 1. Metals--Microanalysis 2. Metals--Deformation 3. Metals--Test results

Card 2/2 V. N.

Lozinskiy, M. G.

24-9-7/33

AUTHORS: Antipova, Ye. I., Guterman, M. B. and Lozinskiy, M. G. (Moscow)

TITLE: Certain features of polymorphous β to α transformation of pure (iodide) titanium. (Nekotoryye osobennosti polimorfnogo β→α-prevrashcheniya chistogo (iodidnogo) titana).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.9, pp.45-49 + 6 plates (USSR)

ABSTRACT: Until very recently very little information has been published on direct observations of the polymorphous transformation of titanium and no detailed information was available on the kinetics of this process, the exception being a paper by Lozinskiy, M.G. (Ref.7). Such direct observations at elevated temperatures can only be carried out by heating in vacuum with a residual pressure of 10^{-5} to 10^{-6} mm Hg (Ref.8). In this paper the experiments are described which were carried out by the authors at the Institute of Mechanical Engineering, Ac.Sc. USSR (Institut Mashinovedeniya AN SSSR) on titanium containing various small additions of iron, silicon, aluminium and carbon, as specified in the table, p.45. The experiments

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Certain features of polymorphous β to α transformation of pure (iodide) titanium.

were carried out by means of methods and equipment described in the book "High Temperature Metallography" of Lozinskiy, M.G. and also by means of dilatometric tests in the temperature range from room temperature up to 1000°C. Titanium specimens of 6 x 2 x 60 mm were used, whereby the metallographic cut was made at the 60 x 6 mm surface. The graph, Fig.1, p.46, shows dilatometric curves for temperatures up to 1000°C and these show that α to β transformation starts at about 860 to 880°C and that β to α transformation proceeds at 900 to 880°C. Fig.2 shows a series of micro-photographs taken from the same surface of a specimen during heating for twenty minutes at 1050°C at a vacuum of 10^{-5} mm Hg. Fig.3 shows a series of micro-photographs of a specimen surface during β to α transformations in vacuum. Fig.4 shows a micro-photo of a "plane" crystal of α-titanium forming in the process of polymorphous transformation when investigating the micro-structure in vacuum; Fig.5 shows a micro-photo of a "plane" α-titanium crystal subjected to β to α transformation during cooling in vacuum. Fig.6 shows a martensite-like micro-relief during β to α transformation

Certain features of polymorphous β to α transformation of pure (iodide) titanium.

on a polished surface of a titanium specimen, whilst Fig.7 shows a micro-photo of a zone of coexistence of the original micro-structure of the iodide titanium specimen and of the micro-relief forming as a result of β to α transformation. By means of high temperature metallography methods, the different kinetics of growth have been elucidated of α-titanium crystals during polymorphous β to α transformation. It was established that the time of formation and growth of α-titanium crystals until reaching their final dimensions may exceed 1/16 sec and may also continue at a rate of 0.8-1.2°/sec. In individual cases an additional growth of the α-titanium crystals with an average rate of 0.06 to 0.08°/sec was observed during the polymorphous transformation. The here described schemes illustrate the causes of observation of differing kinetics of growth on the α-titanium grains observed on the specimen surfaces.

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

SUBMITTED: May 24, 1957.
AVAILABLE: Library of Congress.
Card 3/3

LOZINSKIY, M. G.

AUTHOR: Lozinskiy, M. G. (Moscow)

TITLE: Some trends of further development of high temperature metallography. (Nekotoryye napravleniya dal'neyshego razvitiya vysokotemperaturnoy metallografii)

24-11-3/31

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1957, No.11, pp. 14-26 + 8 plates (USSR)

ABSTRACT: From 1947 onwards development work was started in the A. A. Baykov Institute of Metallurgy, Ac.Sc. USSR (Institut Metallurgii im. A. A. Baykova AN SSSR) under the direction of N. T. Gudtsov on methods and instruments for investigating the micro-structure and the properties of materials within a wide range of temperatures and a number of investigations were carried out (Refs.10-13). This trend was further developed in the Institute of Mechanical Engineering, Ac.Sc. USSR (Institut Mashinovedeniya AN SSSR) where investigations were carried out of the temperature dependence of the properties and of the micro-structure of heated metals and alloys under the direction of I. A. Oding between 1950 and 1953 (Refs.14-17) and from then onwards under the direction of the author of this paper (Refs.18 and 19). The various fields of investigations carried out by means of

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Some trends of further development of high temperature metallography. 24-11-3/31

high temperature metallography methods can be sub-divided into two fundamental groups, namely: methods used for studying the micro-structure of heated metals and alloys; studies made during the investigation of the properties of materials within a wide range of temperatures. For instance, in studying the relations governing plastic deformations of metals and alloys, the magnitude of deformation is determined and the changes are investigated in the micro-structure of the specimens during the process of heating in vacuum. In this paper a general review is given of the results obtained by means of high temperature metallography methods in the laboratory of the author of the Institute of Mechanical Engineering, Ac.Sc., relating to the features of the processes of deformation of steel in the case of uniaxial tension and the effect of repeated heating-cooling cycles. Furthermore, the technique of selective colour oxidation is illustrated on some examples which permits detection of the crystallographic orientation of the individual grains and of the features of the micro-structure of metals and alloys subjected to heating in vacuum. Also, a brief description is given of the ИМАШ-5М test set-up which

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Some trends of further development of high temperature metallography.

was produced in 1956 in the Institute of Mechanical Engineering, Ac.Sc. and which permits direct observation under the microscope, photographing and filming of the micro-structure of various materials and also permits measurement of deformations of heated specimens. In para.1 detailed information of the new ИМАШ-5М apparatus for studying the micro-structure of metals and alloys at heating temperatures up to 1100°C, by means of which it is possible to produce simultaneously tensile stresses of up to 60 kg/mm^2 and to measure deformations with an accuracy of ± 1 μ, is given. Fig.2, p.17 contains an axonometric drawing of the working chamber. Fig.3, p.18 is a photo of the front view of the apparatus; Fig.4, p.19 gives the basic electrical circuit diagram of the apparatus; for heating an active specimen cross section of 3 x 3 mm to 1500°C a transformer rating of 3 kVA is required. The apparatus can also be used for investigating the micro-structure of specimens in the no-load state, for instance, for studying the relations governing the recrystallisation, polymorphous transformations and other processes taking place during heating and cooling. The further parts of the paper deal with results obtained by means of such apparatus,

Some trends of further development of high temperature metallography.

describing in para.2 the influence of repeated heating-cooling cycles on the progress of deformation of steel 30XГCA containing 0.32% C, 0.92% Si, 0.98% Mn, 0.41% Ni and 0.98% Cr. The configuration of the used specimens is shown in Fig.1, p.16. For obtaining data on the magnitude of deformation in the case of a constant temperature as well as during cyclic temperature changes, the experiments were effected with isothermal holding of the specimens after heating to 880°C and also by changing their temperature in the range 880 to 640 and 880 to 150°C. It was found that in specimens tested after isothermal holding, following after heating to 880°C, and also in specimens subjected to cyclic changes of the temperature between 880 and 150°C neck formation and fracture always occur in the middle part of the specimen. However, specimens subjected to cyclic heating and cooling in the range 880 to 640°C develop two necks in the zone of "dangerous" temperatures and this leads to a low creep resistance. Some of the actual results of these experiments are plotted in the graphs and photographs, Figs.6-14. Para.3 deals with detection of the features of the micro-structure of heated materials by means of

Some trends of further development of high temperature metallography.

coloured selective oxidation. The coloration is based on the varying thickness of deliberately produced oxide layers. Work in this field was first carried out by the author together with N. T. Gudtsov and later by the author jointly with M. P. Matveyeva and Ye. I. Antipova (Refs.18,21,22). Figs.15a shows a micro-photograph of the surface of a low carbon steel specimen (0.18% C) after annealing for twenty minutes at 1200°C in a vacuum of 10^{-5} mm Hg and then cooling it to 500°C; following that, air at atmospheric pressure was introduced at the latter mentioned temperature for 45 secs and within a further minute the chamber was again evacuated to 10^{-3} mm Hg, after which the specimen was cooled to room temperature and then its micro-structure was observed. Fig.15b is a similar micro-photograph of pure iron containing 0.03% C after selective oxidation according to the above mentioned regime, preceded by annealing at 1250°C in vacuum. Thus obtained coloured micro-photos for pure nickel and for a high alloy, Cr-Mo high temperature cast alloy are reproduced in Fig.15 B and 2.

NOTE: See also article by the same author relating to this

Some trends of further development of high temperature metallography. 24-11-3/31
subject in "Metallovedeniye i Obrabotka Metallov",
1957, No.11, pp.18-42.
There are 15 figures and 22 references, 19 of which are
Slavic.

SUBMITTED: August 2, 1957.

AVAILABLE: Library of Congress.

Card 6/6

LOZINSKIY, M. G.

AUTHOR: Lozinskiy, M.G., Doctor of Technical Sciences. 129-11-2/7

TITLE: Trends of development of high temperature metallography. (Napravleniya razvitiya vysokotemperaturnoy metallografii).

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1957, No.11, pp.18-42 + 2 plates (USSR)

ABSTRACT: The author, who is a leading authority in this field, reviews exhaustively Soviet developments in high temperature metallography. The major difficulty caused by oxidation of the specimen surfaces during micro-structural investigations at high temperature can be overcome by heating the specimens inside a protective gaseous medium or in a vacuum of 10^{-4} to 10^{-6} mm Hg. The microstructure of heated specimens can be detected by subjecting the surface to the aggressive effect of gases. The basic factor producing micro-relief on a polished specimen surface during heating in vacuum are: the selective evaporation, the effect of internal stresses occurring as a result of differences in the volumes of existing phases, anisotropy of the coefficients of thermal expansion of individual crystallites, etc. On heating the investigated material to 0.5 to 0.6 times the melting point temperature in a vacuum of 10^{-4} to 10^{-6} mm Hg, the evaporation of atoms from the

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Trends of Development of High Temperature Metallography.

boundaries in the individual parts of the grains of the specimen surface proceeds with differing intensities. The evaporation is more intensive from the boundaries than from the grain surfaces due to the presence of unavoidable imperfections and distortions of the crystal lattice of the boundaries. Apparatus for investigating the microstructure of metals and alloys during high temperature heating and cooling in vacuum has been described in great detail in earlier work, particularly in the book "High temperature metallography", Mashgiz, 1956, by the author of this paper. This paper contains detailed information on new "ИМАШ-5М" apparatus for studying the microstructure of metals and alloys at heating temperatures up to 1100°C by means of which it is possible to produce simultaneously tensile stresses of up to 60 kg/mm^2 and to measure deformations with an accuracy of $\pm 1\mu$. Fig.2,p.21, contains an axonometric drawing of the working chamber and Fig.3, p.23, a photograph of this chamber. Fig.4, p.24, is a photo of the front view of the apparatus, Fig.5,p.25, gives the basic electrical circuit diagram of the apparatus. For heating an active specimen cross section of 3 x 3 mm to 1500°C a transformer rating of 3 kV is required. The

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Trends of Development of High Temperature Metallography.

apparatus can also be used for investigating the micro-structure of specimens in the no-load state, for instance, for studying the relations governing the recrystallisation, polymorphous transformations and other processes taking place during heating and cooling. A few examples are given of micro-structure investigations of heated metals and alloys describing experiments which were partly carried out by the author and partly by Ye. I. Antipova and M.B. Guterman. Fig.6, pp.28-29, shows a series of exposures representing the process of polymorphous β to α-transformation of high purity titanium containing about 0.1% admixtures. Sub-microscopic structural changes in the same section of the surface of an electrolytic cobalt specimen can be followed from the micro-photographs given in Fig.7, p.30. Fig.8a, p.31, shows the micro-structure of the surface of a tin-bronze specimen containing 12% Sn after annealing in vacuum for 15 minutes at 780°C followed by cooling to room temperature with an average speed of about 10°C/sec; the surface of a nickel specimen of high purity annealed for one hour at 1150°C in vacuum and cooled to room temperature has a similar appearance to that shown in Fig.8b, p.31. Fig.9, p.32, shows the micro-structure of

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a "Steel 45" specimen after annealing in vacuum at 1350°C for thirty minutes. In investigating the relations governing the process of deformation of metals and alloys by direct observation by means of the above described apparatus, a number of phenomena were observed which are not confirmed by other types of investigation. For instance, in microscopic investigation of the surface of specimens of pure cobalt, in the case of heating to 400°C and simultaneous loading with 6 kg/mm^2, elastic behaviour was observed of the individual crystallite volumes which become displaced as a result of the anisotropy in the properties of the hexagonal lattice; a clearly visible micro-relief forms on the surface. On removing the stresses and cooling the specimens, the micro-relief ceases almost entirely except in spots in which residual shear deformation takes place in such zones. The sections in which an elastic micro-relief is observed represent zones with defects in the crystal lattice. Very probably, experimental results obtained by high temperature metallography methods will support the existing theory of dislocations. Micro-photographs relating to such phenomena are given in Fig.10, p.34, for a pure cobalt specimen and in Fig.11, p.35,

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for a nickel-molybdenum alloy with a specific load of 21 kg/mm^2 at 600°C. Studies are also described for determining the "equi-cohesion temperature range" at which the boundary and the body of the grains show equal strength. Other interesting studies relate to investigating the relations governing deformation and disruption of metals in the case of repeated heating-cooling cycles and observing the resulting changes in the micro-structure for a given section of the specimen surface. Detailed results of such studies are described for specimens of Steel 30ХГСА containing 0.32% C, 0.92% Si, 0.98% Mn, 0.4% Ni and 0.98% Cr. Fig.13,p.37, shows eight micro-photos obtained from this steel after repeated heating-cooling cycles and simultaneous loading with a tensile load in vacuum after 100, 150, 200, 300, 350, 400 and 500 heating and cooling cycles; these micro-photos permit following the development of the micro-relief and cracks along grain boundaries for various numbers of heating and cooling cycles. Such tests also enable to detect the temperature range in which the material has the lowest strength values and some such results are given for the above mentioned steel in Fig.14, p.38. The author draws attention to a certain feature of

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the recrystallisation process which manifests itself by a sudden increase in the grain dimension at a certain critical temperature in which a temperature variation by a few centigrade leads to an increase of the grain surface in the plane of the cut by several tens and even hundreds of times, which is attributed to overcoming of a certain energy barrier. Selective oxidation producing colour patterns is a very promising method of investigating the fine microscopic and sub-microscopic structure and the crystallographic orientation of the individual sections and grains of heated metals and alloys; this is produced by introducing for a short duration, from a fraction of a minute to several minutes, air into the vacuum chamber, as a result of which a thin film of oxides forms, the thickness of which depends on the chemical activity of the respective spot of the specimen and the temperature and duration of the reaction due to interference phenomena. Films show a differentiated colour pattern which permits judging the degree of anisotropy of the grains on the specimen surface. Fig.19, plate, shows such a coloured micro-photo of a low carbon steel containing 0.18% C, after annealing in vacuum at 1200°C for twenty minutes,

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cooling down to 500°C and then introducing air at atmospheric pressure for 45 secs. Similar micro-photos are reproduced for pure iron containing 0.03% C, Fig.20 (plate), for a cast nickel base scale resistant alloy, Fig.21 (plate) and for a cast Cr-Mo alloy, Fig.22 (plate). There are 22 figures and 23 references.

ASSOCIATION: Institute of Mechanical Engineering, Ac.Sc., U.S.S.R. (Institut Mashinovedeniya AN SSSR).

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LOZINSKIY, M.G.

CZECHOSLOVAKIA/Solid State Physics - Mechanical Properties of Crystals and Polycrystalline Substances E-10

Abs Jour : Ref Zhur - Fizika, No 7, 1958, No 15715

Author : Lozinskiy M.G.
Inst : Not Given
Title : Laws of Plastic Deformation of Steel in Repeated Cycles of Heating and Cooling and Certain Features of the Microstructure of Metals and Alloys at High Temperatures

Orig Pub : Hutnicke listy, 1957, 12, No 11, 974-985

Abstract : The method of high temperature metallography was used to investigate the process of deformation of steel in constant stretching tension and the action of repeated heating and cooling cycles. A procedure is detailed for colored selective oxidation; which makes it possible to display the crystallographic orientation of individual grains and the peculiarities of the microstructure of metals and alloys, subjected to heating in vacuum. A brief description is made of the apparatus of the IMASh-5M type, produced at the Institute of

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CZECHOSLOVAKIA/Solid State Physics - Mechanical Properties of Crystals and Polycrystalline Substances E-10

Abs Jour : Ref Zhur - Fizika, No 7, 1958, No 15715

Machine Research of the Academy of Sciences, USSR, making it possible to observe directly in the microscope, to photograph, and to take motion picture films of the microstructures of different materials, and also to measure the deformations of heated specimens.

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Lozinskiy M.G.

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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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 "МК", 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

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-5К" 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/mm^2 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

Achievements and Tendencies in the Development of Soviet Metallography 32-10-16/32

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.

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1. Science-USSR-Progress 2. Microscopy

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LOZINSKIY, M.G., doktor tekhn.nauk.

Development of using rapid induction heating in industry. (MIRA 10:10)
Vest.mash. [37] no.11:66-74 N '57.
(Induction heating)

ASSONOV, Aleksandr Danilovich,; SHEPELYAKOVSKIY, Konstantin Zakharovich,; LANKIN, Petr Aleksandrovich,; YAITSKOV, S.A., inzh.; SHKLYAROV, I.N., inzh.; RABIN, M.O., inzh.; SHNYUSHKIN, N.V.; ZHIVOTOVSKIY, A.N.; BORISOV, N.I.; SHMYKOV, A.A., doktor tekhn. nauk, red.; LOZINSKIY, M.G., doktor tekhn.nauk, retsenzent,; MODEL', B.I., tekhn.red.

[Gas cementation with induction heating] Gazovaia tsementatsiia s induktsionnym nagrevom. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1958. 87 p. (MIRA 11:12)
(Cementation(Metallurgy))

BETANELI, Archil Iosifovich,; LOZINSKIY, M.G., doktor tekhn. nauk, retsenzent,; LARIN, M.N., doktor tekhn. nauk, prof., retsenzent,; LOPADZE, T.N., kand. tekhn. nauk, dots., red.; EL'KIND, V.D., tekhn. red.

[Hardness of steel and hard alloys at high temperatures] Tverdost' stalei i tverdykh splavov pri povyshennykh temperaturakh. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroit. lit-ry, 1958. 94 p. (MIRA 11:12)

(Steel--Testing)
(Alloys--Testing)
(Metals at high temperatures)

18(5) PHASE I BOOK EXPLOITATION SOV/1495

Lozinskiy, Mikhail Grigor'yevich

Promyshlennoye primeneniye induktsionnogo nagreva (Industrial Application of Induction Heating) Moscow, Izd-vo AN SSSR, 1958. 470 p. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut mashinovedeniya.

Resp. Ed.: P. Ye. D'yachenko; Ed. of Publishing House: V.S. Rzheznikov; Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for engineers, technicians, and advanced students of machine-building vtuzes interested in the modern theory and practice of induction heating and in equipment for rapid contactless heating of metals. The book may also be useful to designers and engineers in machine-building plants dealing with technological processes connected with induction heating.

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Industrial Application (Con't.)

COVERAGE: The author explains the theoretical principles of induction heating of metals. He provides the necessary technical data for designing induction heaters for heating limited areas of objects of various shapes (zonal heating) and describes the construction and principles of designing machine tools and attachments insuring efficient application of rapid induction heating. He explains in detail the changes occurring in steel after surface hardening by induction heating and the selection of optimum conditions for rapid heating and subsequent cooling. The book is based on investigations carried out by the author and on industrial experience in induction heating. It discusses the special features of various new technological processes associated with induction heating, introduced in the USSSR and abroad. It also describes the newest types of Soviet and foreign induction heating equipment for frequencies of 50 cps to 10 Mc. The author dedicates this work to the late V.P. Vologdin, Professor and Corresponding Member of the Academy of Sciences, USSSR, who laid the foundations for the application of induction heating in the USSR. He refers to A.D. Assonov, K.Z. Shepelyakovskiy and P.A. Lankin, who successfully developed the method of rapid carburization by induction heating. The following institutions are mentioned as having made contributions in the field:

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Leningradskiy elektrotekhnicheskiy institut, NIITVch, Leningradskiy politekhnicheskiy institut and the Leningrad plant "Svetlana". The author acknowledges the achievements of Engineers R.F. Aladzhev, G.I. Babat, Yu.B. Vigdorovich, A.A. Razgulyayev, A.A. Baturichev, V.A. Vasil'yev, N.A. Moffet, B.N. Shustov, and I.A. Oding, Corresponding Member of the Academy of Sciences, USSR. The surface hardening process by induction heating was developed by the Moscow Steel Institute under the supervision of Professor I.N. Kidin. The author also mentions one foreign theoretician and inventor - E. Northrup. There are 221 references, of which 193 are Soviet, 22 English, 3 German, 1 French and 1 Polish.

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LOZINSKIY, M.G.

24-1-2/26

AUTHORS: Guterman, M.B., Dron', N.A., Lozinskiy, M.G., and Teumin, M. I. (Moscow).

TITLE: Simultaneous application of X-ray and micro-structural analyses for studying the processes of deformation in heated metals and alloys. (Odnovremennoye primeneniye rentgeno- i mikrostrukturnogo analizov dlya izucheniya protsessov deformatsii nagretykh metallov i splavov).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, No.1, pp. 11-20 + 2 plates (USSR)

ABSTRACT: In studying the kinetics of the process of deformation of metals and alloys within a wide range of temperatures and deformation speeds it is of great scientific and practical interest to investigate simultaneously the changes in the micro-structure of the material and the distortions of the crystal lattice caused by stresses of the first and second type by using X-ray methods. Apparatus developed by the Institute of Engineering Technology AS USSR (Institut Mashinovedeniya AN SSSR) and described in earlier papers (Refs. 1-3) enables observation directly under a microscope and on photographs of the microstructure of metals and alloys during the process of heating up to 1100°C applying simultaneously tensile making

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Simultaneous application of X-ray and micro-structural analyses for studying the processes of deformation in heated metals and alloys.

stresses of 0 to 60 kg/mm^2. Observation of the micro-structure during tensile stresses permits only seeing the results of sliding processes and of viscous displacement along the boundaries of the grains and the blocks. The micro-relief forming thereby on the polished surface of the specimen reflects the occurring changes in the micro-structure. It is particularly important to emphasize that these changes are due to processes which in most cases are irreversible and take place in volumes of the order of one or several grains. Processes preceding deformation cannot be investigated by micro-structural analysis but only by X-ray structural analysis, namely, by measuring the period of the crystal lattice for determining the magnitude of the internal stresses of the first type (elastic as well as residual) and also for determining the distortions in the crystal lattice caused by type II stresses. For obtaining a clear picture characterizing the stress state on the basis of X-ray diffraction patterns from individual crystallites, it is necessary to use a sharp X-ray beam. This can be

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aperture or by applying an X-ray tube with a strong focussing system. Use of standard X-ray tubes (and a diaphragm) involves long exposure times of several hours. X-ray tubes with sharp focussing which would permit reducing considerably the exposure time have so far not been produced by Soviet industry. In a number of cases X-ray tubes with sharp focussing which can be assembled and disassembled were used in Soviet and non-Soviet laboratories. The disadvantage of using such tubes is that it is necessary to apply a system of evacuation and of controlling the vacuum, which makes the equipment cumbersome and complicated to operate. In this paper the results are described which were obtained with specimen of metals by sharp beam X-ray tubes, which were developed recently by two of the authors, photos of which are shown in Figs. 1 and 2. Furthermore, the design and operation is described of new test equipment, type NMAШ-8, developed in the Institute of Engineering Technology by two of the authors of this paper and intended for studying the processes of deformation of metals and alloys during heating in vacuum using simultaneously micro-structural and X-ray structural methods of investigation.

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One of the developed tubes uses a magnetic focussing system, the drawback of which is that it is impossible to obtain a very sharp focussing for the used coil sizes. The tube with electrostatic focussing, Fig.2, is free of this drawback and produces a focal spot of a minimum of 40μ. The developed tubes work with an anode voltage of 40 kV; the anode current is up to 200 μA for the tubes with electromagnetic focussing and copper and iron reflectors and up to 500 μA for the tubes with electrostatic focussing and copper reflectors. The deformation of metals and alloys in the ИМАШ-8 test machine is studied on specimens of the shape illustrated in the sketch, Fig.3. An axonometric picture of the mechanism of the vacuum chamber of the test apparatus is reproduced in Fig.4, and the basic electrical circuit and the vacuum circuit are shown in Fig.5. Fundamentally, the ИМАШ-8 is a further development of the ИМАШ-5 test apparatus which was described in detail in earlier work of one of the authors. As an example of using the ИМАШ-8 test apparatus, in the last part of the paper investigations are described of the process of deformation of a nickel-molybdenum alloy

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containing 7% Mo at 600°C in vacuum. The results of these investigations are graphed in Fig.7. Micro-photographs and X-ray diffraction patterns produced during these experiments are shown in Figs.8 and 9. The simultaneous X-ray structural and micro-structural investigations of the process of deformation of heated materials with the here described equipment using the new, sharp beam X-ray tubes (which permit reducing the exposure time to 1.5 to 2 minutes) opens up extensive possibility of studying the relations governing the softening of metals and alloys. There are 9 figures and 4 references, all of which are Russian.

SUBMITTED: August 26, 1957.

ASSOCIATION: Institute of Engineering Technology, Ac.Sc. USSR. (Institut Mashinovedeniya AN SSSR).

AVAILABLE: Library of Congress.

SOV-129-58-6-2/17

AUTHORS: Lozinskiy, M. G. (Dr.of.Tech.Sci.), Guterman, M.B. and Antipova, Ye. I. (Engineers)

TITLE: Micro Nonuniformity of Deformation of Metals during High Temperature Heating (Mikroneodnorodnost' deformatsii metallov pri vysokotemperaturnom nagreve)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, Nr 6, pp 6-9 and 4 plates (USSR)

ABSTRACT: Oding and Ivanova (Ref.1) have shown that in the volume of specimens subjected to tension at room temperature and at elevated temperature the speed of expansion differs in the individual local sections of sizes of about 10 mm.
In this paper information is given on the relations governing the kinetics of nonuniform deformation in the micro volumes at temperatures above and below the equicohesion temperature, i.e. under regimes at which the grain boundaries are respectively weaker or stronger than the body of the grain. The experiments were effected on equipment developed by the Institute of Machinery, Academy of Sciences, USSR. A valuable feature of this equipment is the possibility of direct observation under the microscope and photographing of the micro structure of the surface of the

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Micro Nonuniformity of Deformation of Metals during High Temperature Heating.

studied specimens when heating up to 1100°C during the process of deformation under tension in vacuum. For measuring the micro hardness a series of indentations by a diamond pyramid were made in the longitudinal direction of the specimen with spacings of about 0.05 to 0.1 mm; these indentations were viewed with a microscope with a magnification of 200 times. During the tests one and the same section of the surface of the specimens was continuously observed and photographed and the produced series of micro photographs permits comparison of the nonuniformity of the deformation and of the individual micro volumes of the specimen. The accuracy of measurement was 0.05%. Figs.2 and 3 (plates) show two series of micro photographs made of the same section of the surface of annealed spceimens of a single phase nickel-molybdenum alloy, with 7% Mo, during heating and tensile stressing in a vacuum of about 10^{-5} mm Hg col. In Fig.4 the deformation is graphed of the

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individual micro sections and of the entire zone during the tests of the specimens, the micro photographs of which are shown in Fig.2. In Fig.5 the deformation curves are graphed of micro sections and of the entire zone during testing of a specimen, micro photographs of which are given in Fig.3. Fig.6 shows the micro structure of a specimen of a homogenized ageing alloy of iron with 12 wt.% Mo after being subjected to tensile stresses of 40 kg/mm^2 at 450°C for 2 hours. In Fig.7 the relative changes of the dimensions of the diagonals of the square indentations (shown in Fig.2), by the diamond pyramid, on the specimen surface are graphed. Fig.8 shows the micro structure of the surface of a specimen of Fe-Mo alloy (12 wt % Mo) after being subjected to a tensile stress of 40 kg/mm^2 at 450°C for 2 hours in vacuum. The here described experimental results have enabled for the first time the recording of the kinetics of the nonuniform process of deformation in micro volumes in a wide temperature range by direct observation. Thereby the nonuniformity observed earlier in relatively larger volumes of lengths of 1 - 10 mm (Ref.1), was considerably more pronounced in sections of dimensions from 50 μ onwards.

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Furthermore, within a single grain, the magnitude of deformation evaluated by distortion of the indentations on the specimen and the change in the spacings of these indentations varies very considerably. There are 8 figures (4 of them plates) and 5 references, of which 4 are Soviet and 1 English.

ASSOCIATION: Institut Mashinovedeniya AN SSSR (Institute of Machinery, Academy of Sciences USSR)

1. Metals - Deformation 2. Metals - Temperature effects
3. Metals - Test methods

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SOV/24-58-6-4/35

AUTHORS: M.G. Lozinskiy and A.E. Fedorovskiy

TITLE: Elastic Vibrations Measurements as a Method of Investigating the Thermally Induced Changes of Properties of Metals and Alloys (Izucheniye metodom uprugikh kolebaniy kinetiki izmeneniya svoystv metallov i splavov pri nagreve)

PERIODICAL: Izvestiya akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 6, pp 19-29 (USSR)

ABSTRACT: The authors of this paper used a vibrational technique for studying the processes associated with the embrittlement of certain steels tempered at 550°C, and for investigating the anomalous internal friction variation in commercial iron. The experimental apparatus was designed so as to permit measurement in air or in vacuum. Fig 1 illustrates the equipment in diagrammatic form, and its detailed description is given. The test pieces were in the form of wires 6 to 8 mm in diameter and 120 to 200 mm long. At room temperature the natural frequency of transverse vibrations of metal and alloy specimens of this size is usually in the 700 to 1000 kc range. In

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Elastic Vibrations Measurements as a Method of Investigating the Thermally Induced Changes of Properties of Metals and Alloys

order to induce transverse vibrations in the specimens, these were suspended horizontally on two 40 μ diameter tungsten threads. The source of the vibrations was an electromagnetic vibrator, to the membrane of which one of the W threads was attached. The detector of vibrations, to which the other W thread was attached, consisted of a barium titanate piezo-electric crystal. The vibrations of the test piece induced in this crystal a sinusoidal voltage which was amplified and fed into an oscillograph. The maximum voltage was, of course, generated when the specimen was vibrated at its resonance frequency. The direct (Young's) modulus of elasticity was calculated from the resonant frequency, and from the dimensions and the mass of the specimen. The logarithmic decrement was calculated from the rate of decay of the specimen vibrations when the power was shut off. An electro-mechanical counter determined the number of vibrations which occurred before the amplitude decreased by 50%. The circuit diagram of an automatic discriminator for measuring the logarithmic decrement is shown in Fig 2. In Fig 4 the

Elastic Vibrations Measurements as a Method of Investigating the Thermally Induced Changes of Properties of Metals and Alloys

temperature dependence of the logarithmic decrement S is graphed for: commercial iron (curve 1); 2% Mo-Fe alloy (curve 2); 2% W-Fe alloy (curve 3); 2% V-Fe Alloy (curve 4). The curves 1, 2 and 3 were characterised by a peak located at 110°C, similar to that observed previously by Kê (Ref 6). The presence of this peak is attributed to the stress-induced diffusion of the nitrogen atoms. The absence of a peak on the curve of the 2% V-Fe alloy is explained by the affinity of vanadium for nitrogen, as a result of which the amount of this gas remaining in solid solution was insufficient to cause the anomalous effect. In the next stage of the investigation the mechanism of temper embrittlement of the steel 30KhGSA was studied by correlating the results of impact tests carried out on specimens tempered several times at 640 and 540°C, with the results of internal friction measurements made previously on the same specimens. Fig 5 shows the temperature dependence of δ for specimens quenched from 900°C (curve 1). 1000°C (curve 2) and 1150°C (curve 3),