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BORZAKOVSKAYA, I.V. [Borzakivs'ka, I.V.]

Anatomic characteristics of injuries in some woody plants in winter. Ukr. bot. zhur. 18 no.3:40-47 '61. (MIRA 14:12)

1. TSentral'nyy respublikanskiy botanicheskiy sad AN USSR, otdel fiziologii i biokhimii rasteniy.
(Woody plants--Frost resistance)

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BORZAKOVSKAYA, I.V. [Borzakivs'ka, I.V.]

Dynamics of amino acids and different sugars in woody plants of various winter hardiness. Visnyk Bot.sada AN URSR no.4:51-57 '62. (MIRA 16:1)

(Plants—Frost resistance)
(Amino acids) (Sugars)

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BORZAKOVSKIY, I.V., agronom

Planting winter crops on stubble. Zemledelie 25 no.7:11-19 Jl '63. (MIRA 16:9)

(Kazakhstan--Grain) (Siberia--Grain)

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BORZAKOVSKAYA, I.V. [Borzakivs'ka, I.V.]

Effect of variable temperatures and some chemical substances on the winter hardiness of walnut and chestnut seedlings. Ukr. bot. zhur. 21 no.4:16-24 '64. (MIRA 17:11)

1. TSentral'nyy respublikanskiy botanicheskiy sad AN UkrSSR, otdel fiziologii i biokhimii rasteniy.

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BORZAKOVSKAYA, I.V. [Borzakivs'ka, I.V.]; MAYKO, T.K.

Winter damages to trees in the process of acclimatization.
Ukr. bot. zhur. 22 no.5:22-30 '65. (MIRA 18:10)

1. TSentral'nyy respublikanskiy botanicheskiy sad AN UkrSSR, Kiyev.

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GREDESKUL, Andrey Borisovich [Hredeskul, A.B.]; BORZAKOVSKIY, Ye.I. [Borzakovs'kyi, IE.I.], kand. tekhn. nauk, otv. red.; STAROSTENKO, T.M., red.; MATVIICHUK, O.A., tekhn. red.

[New Soviet-made motor vehicles] Novi radians'ki avtomobili. Kyiv, 1961. 51 p. (Tovarystvo dlia poshyrennia politychnykh i naukovykh znan' Ukrains'koi RSR. Ser.7, no.11) (MIRA 15:4)

(Motor vehicles)

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RUMANIA

VITA, Alla, Dr, OANA, C., Dr, BORZAS, Ecaterina, Dr, BELDIMAN, V., Dr, GRIGORIU, Z., Dr, HURMUZACHE, T., Dr, GHEORGHIU, Melania, Dr, and WAINFELD, M., Dr. Work performed at the Clinic for Contagious Diseases (Clinica de Boli Contagioase) of the Institute of Medicine (Institutul de Medicina), Iasi.

"Considerations on Two Epidemic Foci of Diphtheria."

Bucharest, Microbiologia, Parazitologia, Epidemiologia, Vol 8, No 1, Jan-Feb 1963, pp 11-14.

Abstract: A study based on the observation of two rural diphtheria foci. Both of them occurred in the fall (October-November) and the source of the disease was the school; morbidity was smaller in the pre-vaccination period due to latent immunity. Both episodes caused familial foci with 2 to 5 infections; secondary infections did not touch children below 3 years of age, reflecting the proper vaccination of this age group. Earlier diagnosis and isolation of the first cases would have prevented the epidemics. Includes 11 references.

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BORZAS, R.

Experiences on a trip in Czechoslovakia to study ready-made shoes, p. 59, BOR- ES CIPOTECHNIKA, (Boripari Tudomanyos Egyesulet mint a Magyar Tudomanyos Egyesuletek Szovetsege Tagegyesulete) Budapest, Vol. 5, No. 3, June 1955

SOURCE: East European Accessions List (EEAL) Library ofCongress, Vol. 4, No. 12, December 1955

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ALEKHIN, S.N.; BORZASEKOV, V.F.; MAZUROVA, L.G.

Underground waters in Tertiary deposits of Kopet-Dag. Izv. AN Turk. SSR. Ser. fiz.-tekh., khim. i geol.nauk no.5:92-98 '61. (MIRA 14:11)

1. Institut geologii AN Turkmenskoy SSR.
(Kopet-Dag--Water, Underground)

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZASEKOV, V.F.

The Kara Kum artesian basin, a first-rate water-drive system. Izv. AN Turk. SSR. Ser. fiz.-tekh., khim. i geol. nauk no.6:85-92 '64. (MIRA 18:4)

1. Institut geologii Gosudarstvennogo geologicheskogo komiteta SSSR.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZASEKOVA, L.G.

Subsurface discharge of deep-seated waters in the Kara Kum artesian basin. Izv.AN Turk.SSR.Ser.fiz.-tekh., khim.i geol.nauk no.2:98-105 '62. (MIRA 15:4)

1. Institut geologii AN Turkmenskoy SSR.
(Kara Kum--Water, Underground)

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BORZDOVA, A.A.

AZNAUR'YAN, M.S., vrach, BORZDOVA, A.A., med.sestra, LAPSHINA, L.L., med.sestra (Vladivostok)

Duodenal exploration. Med.sestra 17 no.7:21-22 Jl '58 (MIRA 11:7)
(DUODENUM)

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L 38445-66 EWT(m)/T DJ

ACC NR: AP6018314 (A) SOURCE CODE: UR/0256/65/000/011/0048/0050

AUTHOR: Borzdov, L. M. (Engineer, Colonel)

ORG: None

40
B

TITLE: Rocket troops prepare technical equipment for winter operations

SOURCE: Vestnik protivovozdushnoy oborony, no. 11, 1965, 48-50

measuring instrument

TOPIC TAGS: missile ground equipment, ordnance, missile force organization, electronic equipment /MILU measuring instrument

ABSTRACT: The preparation of various equipment for operations in winter is discussed on the basis of experience acquired by some missile units. The use of appropriate antifreeze lubricants and the general overhaul of electronic equipment is recommended. Antennas, wave guides, electron tubes, switches, contactors, etc. must be carefully checked and if necessary replaced. The electron tubes are tested by using instruments of MILU-1 and MILU-2 types. Checking and testing should be done under good weather conditions before the beginning of winter. Various electric heaters must be installed and control cabins and equipment protected. Inside surfaces of wave guides must be preserved from formation of ice and moisture. The ventilation system must be cleaned and

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ACC NR: AP6018314

summer dust removed. Special attention must be paid to preservation of insulated cables. Cable trenches and ducts must be covered and protected from snow. Diesel engines must be located in rooms to avoid excessive cooling of engines and restarting difficulties. The use of antifreeze lubricants and heaters is recommended. Criticism is expressed that not all units strictly follow the prescribed specifications. The fire protection is briefly discussed and some additional measures are recommended. The preparation of motor vehicles, tractors and trailers for winter services must be executed in accordance with general instructions established by the auto-tractor service. Special additional maintenance measures to be used in winter are briefly reviewed especially in connection with electronic equipment. The maintenance of constant temperature and dry air inside control cabins and regular cleaning of ice and snow from outdoor equipment is stressed.

SUB CODE: 15 / SUBM DATE: None

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A simplified method for the determination of the resistance of steel to creep stress. A. Borzdinka. *Zavodskaya Lab.* 2, No. 8, 44-51(1933); *Chem. Zentr.* 1934, II, 3825.—App. and methods for such detns. developed by the Kaiser-Wilhelm Institut für Eisenforschung, Dusseldorf, are described. The resistance of the steel to creep stress is not proportional to the tensile strength as the temp. is varied (700-800°). Some alloyed steels which possess sufficient tensile strength at high temps. at the same time show an extraordinarily low resistance to creep stress. Thus the latter property must be detd. for the conditions under which the steel is to be used and cannot be estd. with safety from values of tensile strength. M. G. M.

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Ca

The structure and properties of silicon-cobalt steels. A. Beradnikov. *Metallurg* (U. S. S. R.) 8, No. 10, 41-4 (1933).—Steel contg. Co 10, Si 5.8 and C 0.1% was tested for hardness and forgeability and microscopically examd. This steel forges badly, even at 1000-1200°. Micrographic examn. showed a ground mass of "silico-cobaltic ferrite" (Co and FeSi in α-soln.) in which are dispersed needles consisting probably of a compd. of Co and Si.

H. W. Rathmann

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CA

Replacement of the nickel in the steel AZGI K. A. M. Borzdyka. *Teknika Vozdushnogo Flota* 6, No. 11, 64-71 (1934); *Chem. Zentr.* 1936, I, 3571.—Expts. on the substitution of Mn for the Ni in a Cr-Ni-W steel of the compn.: C 0.45-0.6, Si 1.0-1.2, Mn 1.0-1.2, Cr 12-14, Ni 26-8 and W 3.0-3.5% showed that an austenite steel contg. C 0.4-5, Cr 15-16, Mn 10-12 and W 2-2.5% was only slightly inferior to the steel of higher Ni content as regards resistance to heat. The austenite Cr-Mn-W steel is especially recommended for the manuf. of exhaust valves for combustion motors. M. G. Moore

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PARABOLIC LAW OF "ELONGATION-TIME" CURVES, AND ITS APPLICATION TO DETERMINATION OF LUIDITY OF STEEL. A. M. Baradika (Zavod. Lab., 1934, 3, 442--445).--The significance of Eckardt's law in measurements of the rate of flow of steels under pressure is discussed. R. T.

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PROCESSES AND PROPERTIES INDEX

Hardness of metals at high temperatures. A. M. Berrdulka and N. M. Orlov. Zavodskaya Lab. 3, 1013-23(1934).—Methods of detn. are discussed.
B. C. A.

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Alloy steels for petroleum distillation plants. S. I. Voll'son and A. M. Boradyka. *Kachestvennaya Stal* 1935, No. 4, 38–43; ~~Chem. Zentr.~~ 1936, I, 4407.—Four heat-resistant steels are investigated. One steel contg. C 0.13, Mn 0.19, Si 0.50, S 0.01 and Cr 5.8% and another contg. C 0.16, Mn 0.53, Si 0.56, Cr 5.6, Mo 0.65 and S 0.013% showed resistance to heat and corrosion which made them suitable for use in the petroleum and chem. industries.

M. G. Moore

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Sources of Heat in the Mechanical Study of Metals at High Temperatures. A. M. Bondarika (*Zavod. Lab.* (*Works' Lab.*), 1935, 4, (5), 556-563; *C. Abs.*, 1935, 29, 7607).—[In Russian.] Various methods of direct and indirect gas and electric heating of specimens are discussed.—N. B. V.

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Embrittlement of alloy steels as the result of continuous heating. A. M. Bozdyka and S. I. Vol'fson. *Kachestvennaya Stal* 4, No. 2, 17-24(1939); *Chem. Zentr.* 1939, I, 4010.—A detailed description is given of lab. investigations of the thermal embrittlement of pearlite and austenite steels. On the basis of these expts. the phys. nature of the thermal embrittlement was detd. The character of internal transitions in the steel which cause the thermal embrittlement are considered and the way in which these transitions depend upon the temp. and duration of heating shown. Possible measures to be taken for the prevention of defects due to thermal embrittlement are explained.

M. G. Moore

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CA

Structure and properties of 6% chromium steel and of molybdenum steel containing 6% chromium. A. M. Borzdyka and S. I. Vol'fson. *Kachestvennaya Stal* 4, No. 4, 43-8(1936); *Met. Abstracts* (in *Metals & Alloys*) 8, 172.—Steels contg. 5-6% Cr and 0.5-0.6% Mo together with low C have exceptional phys. characteristics at temps. up to 600°. The same steels but without Mo are only slightly superior to common C steels. Quenching followed by a high draw increases properties of straight Cr steels of this type both at room and at elevated temps. bringing them close to the properties of Cr-Mo steels. M. W. B.

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The resistance of corrosion-free steels to creep stress

S. I. Volf'son and A. M. Burzdyka. *Kachestvennaya Stal* 4, No. 8-9, 8-12(1936); *Chem. Zentr.* **1937**, I, 2217; cf. *C. A.* **31**, 7379[8].—Corrosion-resistant steels of the following compns. were studied: (1) C 0.1, Si 0.3, Mn 0.45, Ni 0.5 and Cr 12.5%; (2) C 0.4, Si 3, Mn 0.27 and Cr 10.2%; (3) C 0.2, Ni 5.75 and Cr 19.2%; (4) C 0.4, Si 0.30, Mn 8.9, Cr 17, W 2.2 and Ti 0.28. The creep limits detd. agree with those obtained by other investigators. It was established that the Cr-W-Mn steel possesses a decidedly higher resistance to creep stress than the other corrosion-resistant steels investigated, the abs. values approximating those of the highly heat-resistant steel contg. C 0.5, Si 1.8, Mn 0.6, Ni 13, Cr 16 and W 2-2.2%.

M. G. Moore

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THERMOELECTRIC PYROMETER FOR VERY HIGH TEMPERATURES (1500-2000°). A. M. Boradika (Zavod. Lab., 1936, 5, 204-207).-- C-SiC and C-MoC thermocouples are recommended. (R.T.)

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Creep of Stainless Steels. S. I. Wolfson and A. M. Borsdyka. (Katshestvennaia Stal, 1936, No. 8-9, pp. 8-12). The authors investigated the mechanical properties of four stainless steels: (1) 12% chromium; (2) 3% silicon, 10% chromium (silchrome); (3) 5·8% nickel, 19% chromium; and (4) 8·9% manganese, 17% chromium, 2·2% tungsten. They measured the creep velocity at 400° to 600° C. for 140 hr. and made "instantaneous" tests of the limiting stress (for 0·2% and 0·01% elongation), the tensile strength, relative elongation and change of cross-section, from 20° to 700° C. "Instantaneous" tests indicated the same differences in mechanical properties as did the slow creep measurements. The strength of steels (1) and (2) decreased rapidly at 400° to 550° C.; parts made of these steels should not be submitted to mechanical stresses above 500° C. Steel (3), of the austenitic type, was less strong than steels (1) and (2) in the cold, but was by far the best at high temperatures, and can be used up to 700° C. Steel (4), specially prepared for this purpose, had a creep velocity of only one-half that of steel (3) and equalled, from this point of view, Krupp's WF100 steel (14% nickel and chromium, 2% tungsten). These results indicate the possibility of replacing nickel by manganese in the production of stainless steels with good mechanical properties at high temperatures. (In Russian).

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BORZDYKA, A. M.

Heat-resisting and heat-proof steel. Moskva, Glav. red. lit-ry po chernoi metallurgii, 1937. (Mic53-81)

Microfilm TN-5

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Heat-resistant chrome-molybdenum-manganese and chrome-tungsten-manganese steels. —A. M. Borzdyka. *Kachestvennaya Stal* 5, No. 8, 33-6(1937); *Chem. Zentr.* 1938, 2, 981-2.—The mech. properties were detd. by short-time tests. Those of a Cr-Mo-Mn steel contg. Cr 18, Mn 8, and Mo 2-3% at 800-900° were inferior to those of a Cr-W-Mn steel contg. like amts. of Cr and Mn and 2-3% W. The resistance to creep stress of the latter steel was no less than that of a Cr-W-Ni steel. In no case did the addn. of 2-5% W to Cr-Mn steel lower the heat-resistant properties. The addn. of the same amt. of Mo lowered the resistance to heat shown by Cr-Mn steels, especially in the presence of S-contg. gases.

M. G. Moore

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9

Methods of testing the heat resistance of metals and alloys. A. M. Borzdyka. *Zavodskaya Lab.* 6, 1086-97 (1937).—A discussion with math. treatment. Illustrations and 30 references are given. Chas. Blanc

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The Influence of Technological Factors on the Mechanical Properties of Steel at Elevated Temperatures. A. Borzdyka. (Stal, 1937, No. 10, pp. 52–56). (In Russian). The influence of the following factors on the mechanical properties, in particular creep, of steel at elevated temperatures is examined: (*a*) The method of melting, (*b*) the effect of hot-working, (*c*) cold-working, (*d*) heat treatment and (*e*) welding. Reference is made to information published mainly outside Russia.

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Borodyka, A. M. "Mechanical Testing of Metals at High Temperatures." Pp. 192. Leningrad and Moscow, 1938: Onti. (Price 4 roubles.) (In Russian.)

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CA

Mechanical properties and creep resistance of steels for use in equipment for ammonia synthesis. N. A. Minkevich and A. M. Boradyka. *Kachestvennaya Stal* 6, No. 1, 8-18(1938).—Data are given for metallographic characteristics, mech. properties at normal and high temps., creep resistance, and heat resistance of 5 steels for use in equipment for ammonia synthesis. The steels were 2.5% Cr-Mo, 5% Cr-Mo, 5% Cr-Mo-V, 1.5% Cr-Cu and 2.5% Cr-Ti. The steels were prepd. in an acid induction furnace. Grain sizes (A. S. T. M.) were 4, 5, 6, 3 and 5, resp. The creep tests lasted up to 48 hrs. The highest creep resistance was shown by the Cr-Ti steel. It also had the greatest resistance to scale formation at temps. up to 1000°. But its impact toughness was rather low at normal temps. The 3 Cr-Mo steels had rather high and nearly the same creep resistance (stress of 17.4-19 kg./sq. mm. at 400° and 11-11.5 kg./sq. mm. at 500° corresponding to tangential creep of 10^{-6} mm./mm. per hr. in the interval of 24-48 hrs.). At 600° the oxidation of all steels was negligible and not over 0.05 mg./sq. cm. per hr., at 700° it was 0.2 mg./sq. cm. per hr., at 800° it was 0.9 mg./sq. cm. for all 3 Cr steels, 0.74 mg./sq. cm. for Cr-Cu steel, 0.54 mg./sq. cm. for the Cr-Ti steel, and at 900° the oxidation proceeded intensively. B. Z. K.

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New apparatus for testing metal creep by the torsion method. A. M. Borzdyka. Zavodskaya Lab. 7, 62-71 (1938).—Construction and operation details are given.
Chas. Blanc

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The standardization of heat-resistant steels. A. M. Borzdyka. *Vestnik Standartizatsii* **1939**, No. 1, 2-5; *Chem. Zentr.* **1939**, II, 1157.—Heat-resistant steels are classified into the following groups: medium-alloyed steels contg. C 0.10-0.35, Ni 2.75-5.25 or Mo 0.25-0.5%; Si-Cr steels with C 0.35-0.5, Si 2-3.5 and Cr 2.5-12%; high-Cr steels with C 0.15-1.4, Cr 11-32%; and austenite Cr-Ni steels contg. C 0.12-0.5, Si 0.6-1.8, Mn 0.3-0.7, Ni 8-15 and Cr 13-26% or without the Ni content but contg. Mn 12-13%. These steels may also contain up to 1.2% Mo, up to 0.8% Ti, up to 0.3% V and up to 2.5% W.

M. G. Moore

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

3RD AND 4TH ORDERS

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18

Selective Tests on High-Temperature Heat-Resisting Steels. N. Minkevich and A. M. Borzdyka. (Metallurg, 1939, No. 1, pp. 61–78). (In Russian). The following groups of steels were tested with a view to selecting suitable alloys for service at 800–1000° C.:

I. Austenitic chromium-nickel-base steels

	C. %.	Si. %.	Mn. %.	Ni. %.	Cr. %.	W. %.	Mo. %.
Steel (a) . .	0·35	0·75	0·64	15·1	14·2	2·4	0·41
Steel (b) . .	0·40	1·50	0·50	13·0	12·9	11·2	...

II. Austenitic, or nearly austenitic, chromium-manganese-base steels

	C. %.	Si. %.	Mn. %.	Cr. %.	W. %.	Ti. %.
Steel (c) . .	0·38	1·8	12·2	14·7	2·2	...
Steel (d) . .	0·41	1·65	13·6	14·1	3·1	...
Steel (e) . .	0·51	2·3	15·2	13·8	...	2·6

III. Pearlitic, carbide-bearing, chromium-base steels

	C. %.	Si. %.	Mn. %.	Cr. %.	W. %.	V. %.	Mo. %.
Steel (f) . .	0·47	1·8	0·5	9·2	3–4	0·75	...
Steel (g) . .	0·50	1·40	0·5	8·6	...	...	2·25

The behaviour of these steels at elevated temperatures was first studied by dilatometric and hardness measurements and under the microscope, and the structural changes which occurred are

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discussed. These preliminary experiments were followed by scaling tests, short-time tensile tests at 20°, 800° and 1000° C., impact tests at the same temperatures, tests on the development of brittleness on heating at 600° and 800° C. for up to 120 hr. and finally, by creep tests at 800° and 900° C. (10-4% elongation per hr. between the twenty-fourth and forty-eighth hours). The results of the short-time tensile tests and the creep tests enable the steels to be divided into two groups: those resistant to high temperatures and those resistant to low temperatures. Steels (a), (b), (c), and (d) were found to belong to the former, and steels (e), (f), and (g) to the latter group. Steels of the first group differ but slightly among themselves, steels (a) and (c) being the best. At 800° C. the steels of the first group differ from those of the second much more in short-time tensile strength (differences of 200–250%) than in creep strength (differences of 25–35%). These differences were much less at 900–1000° C. Steel (e) was shown by all the tests to have the lowest heat-resistance.

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1ST AND 2ND ORDERS

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9

Ca

Determination of "prolonged strength" of metals at high temperatures. A. M. Borzdyka. *Zavodskaya Lab.* 9, 603-11(1940).—App. is described and dependence of load vs. time before fracture is shown in log coördinates. Advantages of the set-up are: (1) simplicity of app. compared with creep testing, (2) by extrapolation it is possible to det. the "prolonged strength" of the material from data for 100-200 hrs. and (3) detn. of plastic properties of the material which differ at short and prolonged fracture. The method cannot replace the creep test. B. Z. K.

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B.T. B.M.I. 1289

A. Borzdyka, Precipitation Hardening of High Alloy Chrome-Manganese-Titanium Steel. METALLURG, vol. 15, 1940, No. 10, pp. 31-35; 1600 words.

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PROCESSES AND PROPERTIES INDEX

C1

9

Replacing high-carbon spring steel by low-carbon cemented steel. A. M. Borodyka. *Stal* 1943, No. 1/2, 42-4.—Steel wire 0.8-3 mm. in diam. and steel bands 0.5-2.5 mm. thick were cemented throughout at 825-40° by means of charcoal +5% of Na_2CO_3, crab shell and fish scale. The products were normalized by heating in a salt bath at 800-50° for 3-5 min. and air-cooling, hardened by heating in a salt bath at 820-40° for 2-5 min. and cooling in vegetable oil at 40-50°, and annealed by heating in a nitrate bath for 20-40 min. at 300-420°, depending on the rigidity sought. M. Hosch

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1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

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Chromium, Silicon and Aluminium Impregnation of Steel. A. M. Borodika. (Stal: Iron Age, 1945, vol. 156, Oct. 18, pp. 56-61). An English translation of a paper from the Russian journal "Stal" is presented. Experiments in impregnating steel with chromium, silicon and aluminium, using solid and gaseous media, are described. Media in powder form are not recommended. Gaseous cementation using the chlorine compounds of the respective metals as catalysts is advocated for industrial purposes.

COMMON ELEMENTS

COMMON VARIABLES INDEX

MATERIALS INDEX

OPEN

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

AUTHOR INDEX

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Medium-chromium heat-resistant steels. A. M. Bunadyka (Moscow Steel Inst.). *Stal* 6, 102-7(1940).—Several Cr-Mo steels contg. 2.4-2.7% Cr (similar to Croloy-2) were tested for their suitability to replace steels contg. 5-6% Cr in the construction of superheaters for high-pressure boilers. Some of the investigated steels contained Si and Ti or Cb. The 2.5%-Cr steel proved suitable to replace the higher-Cr steels. A steel contg. 1.2% of Si was more heat-resistant than a similar steel with 0.2% of Si. Ti (0.7%) imparted scale-resistance but lowered the mech. properties. Steel contg. Cb was intermediate in tensile strength between Ti-free and Ti-contg. steel. Cb increased the impact strength and creep resistance of steel.

M. Hosch

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CA

Heat-resistant properties of solid solutions of chromium, nickel, and manganese in γ-iron. A. M. Berezhko (I. V. Stalin Steel Inst., Moscow). *Izvest. Sektora Fiz.-Khim. Anal., Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R.* 16, No. 2, 116-25(1949).— This study was confined to austenitic alloys. The thermal treatment was more decisive in detg. the heat resistance of the alloys than their exact chem. compn. Raising the hardening temp. to a point where the carbides and other components completely dissolved in the austenite increased the strength (tensile strength and yield point), greatly increased the resistance to creep, improved the plastic properties (elongation and necking) at low temps. but greatly reduced these properties at high temps., and raised the impact resistance. When the hardening temp. was lowered to a point where the carbides precipitated intensively, all the properties contributing to heat resistance were lowered. The chem. compn. of an austenite alloy should therefore be adjusted to resist corrosion at operating temps.

M. Hosch

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1ST AND 2ND ORDERS

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Ca

9

Heat resistance of ferronichrome and nichrome. A. M. Baradyka and G. V. Estulin. *Stal* 7, 823-30(1947).—When the hardening temp. of alloys of the nichrome and ferronichrome type was raised from 1050-1100 to 1150-1200°, the grain coarsened and the mech. properties at room temp. diminished while the tensile strength, yield point, and creep at 550-600° improved. A change in compn. (Ni 25-80 and Cr 15-20%) of Fe-Cr-Ni alloys which affects the mech. properties quite noticeably had but little effect on the creep. Thus, proper thermal treatment of these alloys was more effective in increasing creep resistance than was the compn. Nichrome and ferronichrome alloys had no inherent tendency to dynamic or static brittleness either at room or elevated temps. Upon aging, the impact elasticity and the plasticity somewhat decreased yet they remained sufficiently high even after prolonged service at 600-800° and stresses causing a creep of the order of magnitude 10^{-7}-10^{-8} mm./min./hr. Industrially, nichrome and ferronichrome-type alloys should be employed where the thermal-stability and heat-resistance requirements are higher than those offered by the less alloyed Fe-Cr-Ni alloys. M. Hosch

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BORZDYKA, A.M.

USSR/Metals
Austenite
Alloys

Mar/Apr 1948

"The Dispersion Hardening of Highly Alloyed Austenite as a Factor of Thermal Stability," A. M. Borzdyka, Inst Gen and Inorg Chem imeni N. S. Kurnakov, Acad Sci USSR, 9½ pp

"Izvest Akad Nauk SSSR, Otd Khim Nauk" No 2, 1948

Studies processes of dispersion hardening of metallic 'gamma,' solid solutions of systems Fe-Cr-Ni and Fe-Cr-Mn in compounds with their mechanical stability (thermal stability), and gives a principle for rational utilization of these processes in practical application to austenite alloys at high temperatures. Submitted 18 Mar 1946.

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PROCESSES AND PROPERTIES INDEX

9

Ca

Temperature dependence of the modulus of elasticity of steels. A. M. Bugolyubov. *Vestnik Mashinostroeniya* 28, No. 2, 13-16(1948). Data of the modulus of elasticity E, critically compiled from the literature and from the author's original work, are tabulated as a function of the temp. for several sorts of C steels (up to 450°), low-alloy steels (up to 600°), and high-alloy steels (up to 700°). The often assumed linearity of E with the temp. is erroneous. The fall of E with rising temp. continues only up to a point, specifically up to 150-300° for C steels, up to 350° for medium-alloy steel with 0% Cr, and up to 400° for the 18-8 Ni-Cr austenitic stainless steel. The higher the limiting temp., the greater the heat resistance of the steel. A 60% decrease of E (relative to room temp.) is found, for C steel, at 500°, for medium-alloy steel at 600°, for the 18-8 stainless at 650°, and for the highly heat-resistant 15-30 steel, at 850°. At room temp., different pearlitic steels have very close E, in the narrow range 20 × 10^3-22 × 10^3 kg./sq. mm. However, differences, detd. by the chem. compn., begin to become distinct at higher temps. In C steels, variation of the C content from 0.1 to 0.5% produces a marked difference in E (10.6 and 19.4, resp.) at 300°. Alloying with Cr, V, W, and particularly with Mo, produces much more pronounced differences in E at higher temps. Not so in austenitic steels, where differences in chem. compn. have a much smaller effect on the thermal variation of E. In particular, replacement of Ni by Mn, in high-alloy steels, has very little effect on E at 400-800°. Addnl. alloying of austenitic steels with W or Mo (6%) has but little effect on their high-temp. E. In the case of pearlitic steels, heat-treatment has no noticeable influence on the high-temp. E. The same remains true for austenitic alloy steels up to 600-700°, but the effect of heat-treatment does manifest itself in E tests conducted at still higher temps. Thus, quenching from 1100-1250°, which produces a coarse-grained homogeneous solid soln., increases E at temps. above 650°, whereas annealing or tempering, which results in sepn. of carbides, decreases E in the same temp. range. In Elinvar (C 0.3-0.5, Ni 32-38, Cr 8-12%), E remains practically unchanged up to 200-250°, but drops to about 80%, of its low temp. value at 500°, and to about 70%, at 600, i.e. it decreases in about the same manner as in austenitic stainless steel.

N. Thon

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BORZDYKA, A. M.

Apr 1948

USSR/Physics
Creep Tests
Steel - Reaction

"Comparative Creep Characteristics of Type 14/14 Nickel-Chrome and Manganese-Chrome Thermostable Steel," A. M. Borzdyka, 3 pp

"Dok Akad Nauk SSSR, Nova Ser". Vol LX, No 2

Describes steel used and methods employed for thermal testing. Determined that microstructure of steel had greater effect of creep resistance than chemical composition of the steel alloy. Submitted by Academician G. G. Urazov, 15 Jan 1948.

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9

Dispersion hardening of highly alloyed austenite as a factor of its thermal stability. A. M. Boradyka (Inst. Geol. chem. Acad. Sci. U.S.S.R., Moscow). *Izvest. Abod. Nauk S.S.S.R., Otdel. Khim. Nauk* 1948, No. 2, 153-60.—In pursuance of previous work (B., *Metallurg* 1939, No. 10; Minkevich and B., *C.A.* 34, 1600°; B. and Estulin, *Trudy Moskov. Inst. Stali* 20(1940)) having shown occurrence of 2 max. of Brinell hardness as a function of time of aging, at 600-800°, in the case of highly alloyed steels, owing to sepn. of, on the one hand, highly dispersed Fe carbides, and, on the other hand, of highly dispersed compds. of W, Cr, Mo, Ti, etc., the effects of aging were investigated under conditions of creep. Tests were made on 6 sorts of austenitic alloys based on Fe-Cr-Ni and Fe-Cr-Mn, fully homogenized or preliminarily aged; ata are given for a steel contg. Ni 14, Cr 14, W 2.5, Mo 0.5, C 0.4%. At 600, 700, and 800°, under, resp., 12, 4, and 2 kg./sq. mm., the alloy quenched from 1200° showed an initial creep of 75.5, 22.0, and 27.5 × 10^{-6} mm., a rate of creep (in mm. 10^{-6}/hr.), in the time intervals 25-35, 24-48, 72-96 hrs., of 2.2, 2.0, 0.0; 1.0, 1.0, 0.2, and 0, 0, 0, a total creep of 110, 55, and 36 × 10^{-6} mm.; under the same conditions, but after tempering at the temps. of the tests, the values were: (600°) 92.0, 3.0, 3.0, 1.0, 126; (700°) 36.0, 3.3, 3.0, 0.8, 105; (800°) 27.5, 3.0, 2.9, 2.3, 71. Thus, creep is increased as a result of preliminary aging, i.e. of preliminary dispersion hardening. In order to det. the role of further sepn. of the disperse phase in the process of creep testing, comparative expts. were run with alloys allowed to age without load, and another bat. n aged for the same length of time and at the same temp., but under a load corresponding to a 10^{-6} relative deformation per hr., for 24, 12, and 4 hrs. at 600, 700, 800, and 900°. Creep tests at 600° (under 15 kg./sq. mm.), on samples quenched or aged at 600, 700, and 800°) and at 700° (6 kg./sq. mm., on samples quenched or aged at 700, 800, and 900°) show the rate of creep r to be lowest for the quenched alloy and to increase regularly with rising temp. of preliminary aging; thus, after 4 hrs. aging at 800°, r is 3-4 times greater than when tested after quenching. Aging under load increases r still further, by 25-35%; only at an aging temp. of 900°, where sepn. and coagulation of carbides are very fast, does the influence of stress during the aging process become smaller even though it is still noticeable. Preliminary artificial aging thus results in an "anemization" of highly alloyed austenite, as it decreases its satn. with alloying elements; this effect parallels, and is of the same nature as the previously reported (B., *Stal* 6(1945)) neg. effect of preliminary temper, at temps. equal or exceeding the temp. of testing, on the thermal stability of aging austenitic alloys, in contradiction, among others, to Austin (*C.A.* 30, 7524°). Generally, up to a certain temp. T_0 (usually 500-600°), the quenched + tempered alloys are thermally more

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stable than if only quenched, as a result of secondary hardness; however, at T_0, the 2 curves intersect, and matters are reversed above T_0; the point T_0 coincides fairly well with the temp. of beginning sepn. of disperse carbides from the solid soln. If such effects are considered as gradual decrease of hardness on prolonged aging at high temps., owing to gradual coagulation of the highly disperse phase, and concomitant loss of the effects of secondary hardness, then, at temps. at which hardness, as a function of time, passes through a max., the creep will initially increase rather slowly but will rise sharply at subsequent stages; on the other hand, at temps. at which the hardness reaches a const. level, creep will decrease with time. Micrographs demonstrate the ineffectiveness of aging of alloys quenched from only a moderately high temp., below that of dissoln. of the carbides; in this case the carbide sepn. in the aging process lacks in dispersity and tends to coagulate, and little difference is seen in the microstructures of quenched and of quenched + tempered samples. Only aging of a fully homogenized alloy ensures highly disperse carbide and only little coagulation, mainly along grain boundaries. Coagulation is further counteracted by applying a load during the aging process; micrographs of samples aged under gradually decreasing load at gradually rising temp showed complete absence of "carbide chains" along grain boundaries. Optimum temps. of quenching and optimum temp. ranges of dispersion aging (with Brinell hardness before and after aging) are listed for a no. of austenitic alloys, e.g.: Cr-Ni steel 18/8, C 0.18, 1150°, 600-700° (149, 187); Cr-Ni steel 20/25, C 0.35, 1200°, 600-700° (150, 235); Cr-Ni steel 14/14, + W, C 0.25, 1100°, 600-650° (163, 217); Cr-Mn steel 14/14, C 0.45, 1100°, 600-700° (221, 321); nichrome 15/10, C 0.15, 1150°, 600-700° (156, 187).

N. Thon

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Brit. abs.

Comparative creep characteristics of chromium-nickel and chromium-manganese heat-resisting steels of the 14 : 14 type. A. M. [illegible] (*C. R. Acad. Sci., URSS*, 1948, 60, 223—225).—

Measurements of creep were made at 500—700° under loads of 8—18 kg. per sq. mm., for 1000 hr., on 4 steels which had previously been heated at 1000—1100° or 1200—1250°. The steels all contained Cr 14, W 2·5, and C either 0·15 or 0·5%; two contained Ni 14 and two Mn 14%. All had an austenitic structure, but the Mn 14-C 0·15 steel contained 10—25% of ferrite. To produce a creep of 10^{-4} mm. per mm. per hr. required 10·4—14 kg. per sq. mm. at 600° and 4·0—5·0 kg. per sq. mm. at 700°, the ferritic Mn steel being slightly superior to the other steels. A. B. DENSHAM.

(BA - BI Ap '50: 343)

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1ST AND 2ND ORDERS

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3RD AND 4TH ORDERS

18

VARIATION WITH TEMPERATURE OF THE HIGH-TEMPERATURE STRENGTH OF METALLIC SOLID SOLUTIONS. A.M. Borzdyka. (Comptes Rendus (Doklady) de l'Academie des Sciences de l' U.R.S.S., 1948, vol. 60, Apr. 21, pp. 383-385 (In Russian); (Abstract) Bulletin of the British Non-Ferrous Metals Research Association, 1948, Dec., p. 403). The author reports work on austenitic chromium-nickel steels, and discusses the effect of thermal history on the structure of the grain boundary and the resulting effect on the equicohesive temperature.

(BA - B1 Ap 50 :343)

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Ca

9

Causes of the high heat resistance of coarse-grained chrome-nickel austenite.—A. Buradyka. *Doklady Akad. Nauk S.S.S.R.* 60, 583-5(1948).—The increased heat resistance, characterized by low rate of creep, obtained by quenching from a very high temp., can be detd. either by the grain size, the degree of alloying of the solid soln., or by secondary high-temp. structural transformations taking place in the solid soln. The 1st factor plays a predominant role, and the 3rd none at all, in alloys the chem. compn. of which excludes internal secondary processes, thus in a W steel, Ni 14, Cr 14, C ~0.05%. However this 3rd factor becomes significant to predominant in a steel of otherwise the same compn. but with C 0.4-0.5%; after quenching from a very high temp., this steel contains considerable amts. of complex carbides of Cr, W, or Mo in solid soln., and shows, at 600°, a particularly rapid and drastic decrease of the rate of creep with increasing av. area of the austenite grain (or increasing temp. of quenching). At equal temp. of quenching, the 0.05% C Nichrome steel shows a very much lower rate of creep at 600° than the 0.4-0.5% C steel; the difference reflects the effect of the secondary transformations. If the load corresponding to a creep rate of 10^{-4} mm./mm./hr. is plotted against the log of the av. grain area, nonaging austenitic alloys, such as the very low-C Nichrome steel, give single straight lines, whereas no such linearity is found with alloys subject to dispersion hardening. This is obviously due to the complication introduced by the superposition of the disperse carbide effect on the pure grain size effect.

N. Thon

Evaluation B-69288

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BORZDYKA, A. M.

PA 55/49T82

USSR/Physics Nov 48
Austenite
Alloys

"Influence of Alloying Elements on the Thermal Stability of Chrome-Nickel Austenite," A. M. Borzdyka, 3 3/4 pp

"Dok Ak Nauk SSSR" Vol LXIII, No 3

Four chief alloying elements (tungsten, molybdenum, titanium and niobium) added to industrial iron-chrome-nickel alloys to increase thermal stability have a positive effect connected with aging. Unlike chrome, nickel and cobalt, they differ in

[redacted] 55/49T82

USSR/Physics (Contd) Nov 48

atomic diameter from gamma iron. Isomorphism of the crystal lattices of these four elements of gamma iron contributes to the great hardness of high austenite. Submitted by G. G. Urazov 14 Sep 48.

[redacted] 55/49T82

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PROCESSES AND PROPERTIES INDEX

9

Influence of alloying elements on the heat resistance o. chrome-nickel austenite. A. M. Borzdyka. *Doklady Akad. Nauk S.S.S.R.* 63, 205-7(1948); cf. C.A. 43, 85g.—Plots of the stress P, in kg./sq. mm., corresponding to a const. rate of creep of 10^{-4} mm./mm./hr., at 600 and 700°, of Fe-Cr-Ni alloys with a const. Cr content of 20%, against the Ni content (0-80%), show only an initial rise of P up to 8-10% Ni, with P remaining const. with further increasing Ni content. At const. Ni content — 15%, P increases somewhat with increasing Cr content, but the effect is not very large in the range of solid γ-solns.; thus, with Cr increasing from 10 to 25%, P increases only by 2 kg./sq. mm. at 600° and by 1 kg./sq. mm. at 700°. The relative insignificance of the effect of Ni and Cr is linked with the closeness of the at. diams. of the 3 elements. The slight increase of the high-temp. strength of the alloy by Cr, as contrasted with Ni, is due to its nonisomorphism of γ-Fe. The same explanation applies to the effect of Mn. The beneficial effects of W, Mo, Ti, and Cb on the high-temp. strength of Fe-Ni-Cr alloys are evidently due not only to their favorable influence on dispersion hardening, but, at least in part, to the marked difference between their at. diams. and that of γ-Fe (av. 10-15%). A further factor is the nonisomorphism of the crystal lattices. This accounts, among others, for the increased high-temp. strength of low-C Fe-Cr-Ni alloys under the influence of addns. of W or Mo, even if the alloys have not been subjected to dispersion hardening.

N. Thon

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CA

Grain size of highly alloyed austenite as a factor in its high-temperature strength. A. M. Bazulyka (Acad. Sci., U.S.S.R.). *Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk* **1940**, 121-7; cf. C.A. 42, 7210b.—The high-temp. strength of an alloy of given compn. is detd. by at least (1) grain size, (2) degree of alloying of the solid soln., and (3) dispersion hardening. Grain size is of principal interest in this paper. Jeffries and Archer's equicohesive theory is criticized on the [illegible] at the grain boundaries should be weaker at all temp. Failure should always begin at the grain boundary but may continue through the grain body at lower temps. A possible explanation of grain boundary weakening is that oxidation at higher temps. This would explain the change of equicohesive temp. with time of testing. The effect of dispersion hardening can be made const. in dctns. of grain size effect by producing different inherent grain sizes by means of different degrees of reduction by hot pressing but with the same temp. schedules, especially finishing temp. Two heats of 20/14 steel (C 0.16, Si 2.4, Cr 19.3, Ni 14.1%) were make in this way to have grain sizes of (I) No. 3 (coarse grain), and (II) No. 7 (fine grain). At a stress of 1 kg./sq. mm. at 700°: The initial creep was I 0.0010 and II 0.0267 mm.; the creep rate between the 24th and 48th hrs. was I 0 and II 0.0003%/hr.; the total creep in 100 hrs. was I 0.010 and II 0.125 mm. The short-time tensile test results at 700° were: yield strength, I 17.8 and II 21.0 kg./sq. mm.; tensile strength, I 31.3 and II 30.0 kg./sq. mm.; elongation, I 15.8 and II 20.0%; reduction of area, I 30.5 and II 63.0%; Brinell hardness, I 170 and II 292. To eliminate entirely dispersion hardening effects, a 14/14 steel A (C 0.50, Ni 15.0, Cr 14.3, W 2.25, Mo 0.50, Si 0.55, Mn 0.60%) had grain sizes from 2 to 7-8 produced in various specimens by thermal treatment. Steel B having a compn. (C 0.05, Ni 14.0, Cr 10.0, W 1.48, Mo 0.20, Si 0.50, Mn 0.80%) essentially the same as that of the solid soln. of spheroidized steel A was also prepd. in the range of grain sizes. Steel B showed no dispersion hardening. Creep tests at 12 kg./sq. mm. at 800° and at 6 kg./sq. mm. at 700° gave the following results: increasing the grain size from 7-8 to 2 in steel B decreased the creep rate by a factor of about 2; dispersion hardening in steel A further decreased the creep rate by a factor of about 5; the initial spheroidized carbides have almost no influence on the creep rate. A log-log plot of stress to cause a creep rate of 10^{-6} at const. temp. vs. av. grain area gives a straight line for alloys that do not show dispersion hardening, such as Nichrome 60/20. A broken curve is obtained for alloys that show dispersion hardening.

A. G. Guy

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1ST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

13

13

Comparative Creep Characteristics of Chromium-Nickel and Chromium-Manganese Steel Type 14-14. (In Russian.) A. M. Borzdyka. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), June 1949, p. 900-906.

The above were investigated on four samples of type 14-14 steel with 2.5% W, two being Cr-Ni base and two Cr-Mn base. Each pair included a low-carbon and a medium-carbon steel. The Cr-Mn austenite was found to have much higher (10-20%) thermal stability than the Cr-Ni. Thermal stability of Cr-Mn steel of the austenite-ferrite type is shown to be directly dependent on relative content of alpha and gamma phases. Experimental method is described in detail. Results are tabulated and charted.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

USSR/Engineering
Testing Procedures
Machines, Testing

Jan 49

"New Methods in Mechanical Heat Testing," A. M. Borzdyka, 5 pp

"Zavod Lab" No 1

Discusses four basic problems: (1) testing metals under regulated rates of tension, (2) testing for creep at temperatures 800 to 1,000° obtained by passing high-density currents 500 to 750 a/sq cm through part being tested, (3) testing for creep under bending stress, and (4) testing by relaxation. Describes various types of equipment used in tests.

60/49T26

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A. M.

Mar/Apr 49

USSR/Metals
Alloys
Austenite

"Size of a Grain of High-Alloy Austenite as a Factor of Its Heat-Resistance," A. M. Borzdyka, Inst of Gen and Inorg Chem imeni N. S. Kurnakov, Acad Sci USSR, 7 pp

"Iz Ak Nauk SSSR, Otdel Khim Nauk" No 2

Investigates effect of size of crystal grains of tertiary solid gamma-solutions of system Fe--Cr--Bi on heat-resisting properties. Shows joint effect on these properties of solid solutions subjected to dispersion hardening (aging) for growth of austenite grains and dispersed carbide separation during second annealing of the alloys. Submitted 3 May 48.

43/49T17

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

M

11

New Techniques of Hot Mechanical Testing. A. M. Borzdyka (*Zavod. Lab.*, 1949, **15**, (1), 70-73).—[In Russian]. (1) A method is described for determining the ultimate strength and creep characteristics at high temp. for extension rates of 100, 10, 1, and 0·1%/hr. The test sample is placed in an electric furnace. The ultimate strength and the reduction in area are smaller for low extension rates. (2) A method for mechanical testing at temp. of the order of 1000° C. is described. Heating is effected by passing through the sample A.C. at 500-750 amp./cm.² and 1-3 V.; the high-density current does not affect the crystalline structure or chemical composition of steels. (3) A method of measuring creep in bending under const. load at high temp. on cantilever-loaded thin strips placed in a furnace is dealt with; the deformations are measured optically.—T. O. L.

Dec 1950

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A. M.

"Causes of the Increased High Temperature Strength of Austenitic Chromium-Nickel Steels of Large Grain Size," Reports of the Academy of Science of the USSR, v. 60, No 4, May 1, 1949, pp. 583-585.

Summary and Evaluation: B-69288, 9 Oct 53

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

USSR/Chemistry - Solutions, Solid Apr 49
Chemistry - Systems, Relation Between Temperature and Composition

"The Nature of Composition-Characteristic Curves of Solid Metallurgical Solutions at High Temperatures," A. M. Borzdyka, 3 pp

"Dok Ak Nauk SSSR" Vol LXV, No 4

Studied characteristics of solid metallic solutions as a function of their chemical composition at high temperatures. Established that increase in temperature decreases, curvature of

[redacted] 41/49T4

USSR/Chemistry - Solutions, Solid Apr 49
(Contd)

composition-characteristic curves and leads to smoothing out (and sometimes to complete disappearance) of the maximum or minimum characteristic at ordinary temperatures. Example is the family of isotherms of specific electrical resistance (at temperatures 0 - 1000°) for alloys in the binary system Fe-Ni, which forms the structure of a homogeneous solid gamma-solution Submitted by Acad G. G. Urazov, 1 Feb 49.

[redacted] 41/49T4

PA 41/49T4

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

CA.

2

Character of the composition-property curves of metallurgical solid solutions at high temperatures. A. M. Borodyka. *Doklady Akad. Nauk S.S.S.R.* 68, 505-7 (1949).—Kurnakov's statement that, in analogy with liquid solns., increase of the temp. ought to make the isotherms of a given property of an alloy increasingly flatter, and to move the point of min. elec. cond. in the direction of the component with the lower elec. cond., and the point of max. hardness in the direction of the harder component, is confirmed by the example of the change of elec. cond., in the temp. range 0-1000°, with the compn. of the system Fe-Ni, and of the austenitic system Fe-Cr-Ni at const. 20% Cr. In the latter system, the min. of cond. becomes increasingly shallower with rising temp. and disappears altogether at 800°. The max. of hardness, at about 50% Ni, becomes increasingly flatter with rising temp. and disappears completely at 700°. In the same system, and also in Fe-Cr-Mn, the curve of creep behaves in the same way, becoming a straight line at 600-700°.

N. Thon

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

PROCESSES AND PROPERTIES INDEX

B

13

Grain Size Effect in Creep of Austenite. *Metal Progress*, v. 57, June 1950, p. 798, 800, 802. Translated and condensed from "Grain Size of High-Alloy Austenite as a Factor in Its High-Temperature Strength," A. M. Borzdyka, *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Chemical Sciences, Mar.-Apr. 1949, p. 121-127.

Previously abstracted from original.

COMMON ELEMENTS

COMMON VARIABLES INDEX

MATERIALS INDEX

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

MATERIALS INDEX

AUTHOR INDEX

Fe GROUPS

3RD AND 4TH ORDERS

2ND LETTER

1ST AND 3RD LETTER

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A. M.

178T81

USSR/Metals - Austenitic Alloys 1 Nov 50

"Creep of Austenitic Alloys in Connection With the Phase Diagram," A. M. Borzdyka

"Dok Ak Nauk SSSR" Vol LXXV, No 1, pp 37, 38

Detd creep limits at 600 and 700° for number of binary and ternary alloys of Fe-Cr-Ni system and marked on phase diagram. Creep resistance of nickel austenite, as analysis of diagram shows, is lower than that of chrome-nickel austenite. Exptl data disprove previously existing supposition about high heat resistance of the sigma-phase. By its creep properties this phase is

[redacted] 178T81

USSR/Metals - Austenitic Alloys (Contd) 1 Nov 50

nearer to ferrite than to austenite and its presence lowers creep resistance of solid gamma-soln. Submitted by Acad G. G. Vrazov 8 Sep 50.

[redacted] 178T81

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

c a
1951

9

Influence of niobium additions on creep of heat-resistant austenitic chromium-nickel steel. A. M. Borzdyka. *Doklady Akad. Nauk S.S.S.R.*, 75, 213-14(1950).—An exptl. study was made of the effect of W and Nb on the creep strength of 14/14 Cr-Ni steel. The steel was melted in a high-frequency furnace and 50-kg. ingots were forged to billets 40 mm. in diam. and then rolled to bars 20 mm. in diam. The bars were air-cooled after heating into the I-phase region. The creep rate was detd. in the time interval 72 to 96 hrs. after the beginning of the usual creep test. The stress in kg./sq. mm. that produced creep rates of 10^{-6} and 10^{-7} at 600° and of 10^{-6} and 10^{-7} at 700° in 6 different 14/14 Cr-Ni steels were: (1) unalloyed, 0.12% C; 8.0, 5, 3.0, 3-6; (2) 0.12% C, 1.2% Nb; 13, 9.2, 5.6, 4.0; (3) 0.12% C, 2.1-2.4% W; 11, 8.8, 4.8, 3.4; (4) 0.12% C, 2.1-2.4% W, 0.7-0.8% Nb; 14, 10, 6.0, 4.2; (5) 0.5% C, 2.1-2.4% W; 12, 9.6, 5.0, 3.6; (6) 0.5% C, 2.1-2.4% W, 0.7-0.8% Nb; 13, 9.8, 5.2, 3.0. More than 1.2% Nb caused ferrite to form and lowered the heat resistance. A ratio of Nb/C = 10 is the optimum. A. G. G.

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

Test for creep as a method in physicochemical analysis. Izv.Sekt. fiz-khim.anal. 24:51-58 '54. (MLRA 8:4)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. (Chemistry, Analytical) (Creep of metals)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, Anatoliy Matveyevich

BORZDYKA, Anatoliy Matveyevich; BERNSHTEYN, M.L., redaktor; GOLYATKINA, A.G., [redacted] redaktor; [redacted], Ye.B., tekhnicheskiy redaktor

[Methods of mechanical heat testing of metals] Metody goriachikh mekhanicheskikh ispytanii metallov. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1955. 352 p. (MLRA 8:4)

(Metals--Testing) (Metals, Effect of temperature on)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

SOV/124-57-7-8493

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 7, p 154 (USSR)

AUTHOR: Borzdyka, A. M.

TITLE: On the State of the Methodology of Mechanical Testing of Metals at Elevated Temperatures (O sostoyanii metodiki mekhanicheskikh ispytaniy metallov pri vysokikh temperaturakh)

PERIODICAL: V sb.: Sovrem. metody ispytaniy materialov v mashinostroyenii. Moscow, Mashgiz, 1956, pp 110-124

ABSTRACT: The author systematizes the extant methodology of the testing of metals at elevated temperatures and submits certain recommendations. The following types of the testing of metals at elevated temperatures are described: 1) Creep. The dilatometric, relaxational, and isothermal methods are described. 2) Creep-rupture behavior and plasticity. The yield strengths and creep strengths of some metals and alloys are obtained for different temperatures. 3) Tension. The paper describes short-term tension-test methods and points out optimum tensile testing rates for certain types of specimens. 4) Fatigue. The paper describes two methods of determination of the fatigue limit, namely, the method of determination of

Card 1/2

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the maximum tension under which a given material does not rupture when subjected to a long-term alternating load and the Lehr-Schenk method. 5) Hardness determination. The paper describes the methodology of the determination of the hardness of a metal by means of static and dynamic tests. In conclusion the author points out the possibility of using full-scale tests.

M. R. Shamilev

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

7
4E2c

✓ Evaluating the Long-Term Plasticity of Steel and Other Alloys at High Temperatures, A. M. [illegible] (Zavodskaya Laboratoriya, 1956, 22, (2), 225-229). In Russian. [illegible] quantitative characterization of the plastic properties of steels and other alloys under tension over long periods at high temperatures is considered, special reference being made to V. S. Ivanova's concept of reserve of plasticity. Data on the plasticity of medium-alloy pearlitic steels at 500° C and of high-alloy austenitic steel at 650° C are considered. [illegible] this and other material it is concluded that the [illegible] of plasticity is best characterized by the [illegible] moment of transition from the [illegible] predetermined [illegible]

TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

MIRKIN, I.L., professor, doktor; TRUNIN, I.I., inzhener.

"Methods for hot mechanical testing of metals". A.M.Borzdyka. Reviewed by I.L.Mirkin, I.I.Trunin. Zav.lab.22 no.2:253-255 F '56. (MLRA 9:6)

(Metals--Testing) (Borzdyka, Anatolii Matveevich)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M., dokter tekhnicheskikh nauk; KAMINSKIY, E.Z., kandidat fiziko-matematicheskikh nauk; BUYANOV, N.V., kandidat tekhnicheskikh nauk; GENEROZOV, B.A., dotsent; GOLOVCHINER, Ya.M., inzhener.

"Properties of materials used in turbine building and methods of testing them." Reviewed by A.M.Borzdyka and others. Zav.lab.22 no.4: 511-512 '56. (Metals--Testing) (MIRA 9:7)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKH, A.M.

Antikorosni a Zaruvdorne Oceli (Stainless and Heat Resistant Steels), by R. Pospisil, (Prague, 1956, 237 pp), reviewed by A. M. Borzdyka, Novyye Knigi za Rubezhom, Seriya B, Tekhnika. No 3, Mar 57, pp 44-46

The work reflects over 200 literature references included in the bibliography. "We note with pleasure that 24 references belong to Soviet literature, although the writer did not use the most important achievements of Soviet scientists." The writer also presents results of his own experience at a leading Czechoslovakian metallurgical plant. With this addition the book acquires the aspect of a monograph, and indubitably is of interest to engineers working in the production and application of stainless and heat resistant steels and alloys. (U)

Sum :N 1451

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

AL'TGAUZEN, O.N., kandidat fiziko-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]; GANOV, M.I., inzhener; GELLER, Yu.A., doktor tekhnicheskikh nauk; GORELIK, S.S., kandidat tekhnicheskikh nauk; GOTLIB, L.I., kandidat tekhnicheskikh nauk; GOL'DENBERG, A.A., 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; L'VOV, M.A., kandidat tekhnicheskikh nauk; LIVSHITS, L.S., kandidat tekhnicheskikh nauk; MALYSHEV, K.A., kandidat tekhnicheskikh nauk; MINKEVICH, A.N., kandidat tekhnicheskikh nauk; MEYERSON, G.A., doktor tekhnicheskikh nauk; MOROZ, L.S., doktor tekhnicheskikh nauk; NAKHIMOV, A.M., inzhener; NATANSON, A.K., kandidat tekhnicheskikh nauk; POGODIN-ALEKSEYEV, G.I., doktor tekhnicheskikh nauk; POPOV, A.A., kandidat tekhnicheskikh nauk; POPOVA, N.M., kandidat tekhnicheskikh nauk; RAKHSHTADT, A.G., kandidat tekhnicheskikh nauk; ROGEL'BERG, I.L., kandidat tekhnicheskikh nauk;

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"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

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)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M., doktor tekhnicheskikh nauk.

Effect of structural changes in alloys on the relaxation process. (Letter to the Editor). Vest.mash. 36 no.11:87-88 N '56. (MIRA 10:1)

(Steel-Testing) (Austenite)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.

Category : USSR/Solid State Physics - Mechanical Properties of Crystals and Crystalline Compounds E-9

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6785

Author : Borzdyka, A.M.

Title : On the Status of Procedures for Mechanical Tests of Metals at High Temperatures.

Orig Pub : Sovrem. metody ispytaniy materialov v mashinostroyenii. M., Mashgiz, 1956, 110-124. Obzor. Bibl. 16 vazv.

Abstract : No abstract

Card : 1/1

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

BORZDYKA, A.M.; VITKINA, E.I.; RYL'NIKOV, A.P.; SINITSYN, K.K.; BERNSHTEYN, M.L., red.; GOLYATKINA, A.G., red.izdatel'stva; ISLENT'YEVA, P.G., tekhn.red.

[Ferrous metallurgy of capitalist countries] Chernaia metallurgiia kapitalisticheskikh stran. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii. Pt.5. [New quality steel and methods of testing it] Borzdyka, A.M., and others. Stali novykh marok i metody ispytanii. 1957. 282 p. (MIRA 10:12)

1. Russia (1923- U.S.S.R.) Ministerstvo chernoy metallurgii. TSentral'nyy institut informatsii.
(Steel--Testing)

APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2"

"APPROVED FOR RELEASE: 06/09/2000 CIA-RDP86-00513R000206610004-2

SOV/129-58-12-2/12

AUTHORS: ~~Borzdyka, A.M.,~~ Doctor of Technical Sciences and Merlina, A.V., Engineer

TITLE: Heat-resistant Properties of Complex Alloyed Ferrite (Teploustoychivyye svoystva slozhnolegirovannogo ferrita)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, Nr 12, pp 10 - 16 (USSR)

ABSTRACT: The properties of alloyed ferrite have been studied so far almost exclusively at room temperature and almost no data are available on the influence of individual alloying elements on the strength and plasticity of the alloyed ferrite at elevated temperatures. A paper on this subject was published by Austin, John and Lindsay (Ref 5). The influence of some elements (Mo, W, Cr, Mn, Si, Co, Ni) on the creep resistance of ferrite at 425 °C is graphed in Figure 1. Somewhat more information is available on the influence of various hardening elements on the high-temperature resistance of steels containing 11-14% Cr (Refs 6 - 8). Since the published results relate to alloys containing about 0.1% C, they do not reflect the relations pertaining to alloyed ferrite in the pure state. The authors of this paper considered it advisable to investigate the heat-resistance properties

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of complex alloyed ferrite. The results are described which were obtained on two steels which are most characteristic as regards the ferrite structure and contain Cr, W, Mo and Nb; the composition of these steels was as follows:

	C	Si	Mn	Cr	W	Mo	Nb
KhZMV	0.020%	0.08%	0.42%	2.80%	0.32%	0.38%	-
KhZMVB	0.015	0.30	0.41	2.71	0.40	0.45	0.39%

Both steels were smelted in a laboratory induction furnace of 30 kg capacity and forged into a square rod of 18 mm. The microstructure was investigated after heating to 750 - 1 200 °C with steps of 50 °C and various cooling speeds. Some of the obtained microphotos are reproduced in Figure 2. In Figure 3, the hardness is graphed for the investigated steels as a function of the heating temperature; in Figure 4, the change in the hardness is graphed as a function of the tempering temperature for a hardness after hardening of 255 H_B. The results of the phase analysis, entered in Table 2, indicate that the steel KhZMV contains, after hardening and tempering at 600 °C, negligible quantities of hardening elements (0.07% W and

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Heat-resistant Properties of Complex Alloyed Ferrite

0.05% Mo) and these quantities are distributed approximately equally between the carbide and the inter-metallide phases. The steel KhZMVB consists of a solid solution, an inter-metallide and a carbonitride phase. The major part of Nb (55%) goes into the intermetallide compound, 20% in the carbonitride phase and only 25% into the solid solution. The Fe and Cr are in the solid solution, the W and Mo are predominantly in the solid solution (87.5% W and 88.9% Mo). Tensile tests were carried out on specimens with an active length of 50 mm and diameter of 10 mm; thereby, the material was hardened from 1 150 - 1 200 °C and tempered at 600 °C. It can be seen from Table 3 that the steels had a good combination of high strength and ductility; additional alloying with 0.4% Nb does not alter substantially the mechanical properties at room temperature but it reduces appreciably the impact strength at that temperature. The results of long-duration strength tests at 500 °C (up to 6 000 hours) are graphed in Figure 5. The results of creep tests at 500 °C are graphed in Figure 6. In Figure 7, the impact strength and the hardness are graphed for steels tested at 200 °C, as a function of the

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Heat-resistant Properties of Complex Alloyed Ferrite

duration of holding the specimens at 500 °C prior to the tests. The following conclusions are arrived at: the investigated complex alloyed ferritic steel possesses favourable mechanical properties at room temperature as well as at temperatures of 500 - 550 °C; as regards their high-temperature properties at 500 °C, the investigated steels are as good as certain high-temperature steels of the pearlitic class; introduction of 0.4% Nb into Cr-Mo-W steels brings about a further increase in the creep resistance and long-duration strength and this is attributed to the presence of Nb in the hardening phase; an unfavourable feature of Nb-containing ferritic steel is its slow impact strength at normal temperature and also its reduced ductility under conditions of long-duration tensile stresses at elevated temperatures, which is apparently due to the presence of Nb intermetallides.

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Heat-resistant Properties of Complex Alloyed Ferrite

There are 7 figures and 5 tables and 10 references, 9 of which are Soviet and 1 English.

ASSOCIATION: TsNIIChM

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Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1960, No. 20, p. 17, # 109543

AUTHORS: Borzdyka, A. M., Merlina, A. V.

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TITLE: An Investigation of the Thermal Brittleness of Chromium Steels

PERIODICAL: V sb.: Metallovedeniye i term. obrabotka. ("Stal'", 1958, Prilozh.). Moscow, 1959, pp. 136-146

TEXT: Twenty experimental melts of steels with 3, 5, and 12% Cr were investigated, which were alloyed additionally by various elements. It turned out that steels with 3 and 5% Cr are ready to thermal brittleness after extended heating at 500-560°C. Alloying steels with 3% chromium, Zr, Ti, and V, as well as steels with 3.5 and 12% Cr, W, and Cb does not eliminate their disposition to thermal brittleness. The complex alloying of chromium steels by Mo and W, as well as by Mo, W, and Cb makes them unsusceptible to thermal brittleness within the investigated temperature range, and increases simultaneously the resistance to heat.

B. A. M.

There are 14 references.

Translator's note: This is the full translation of the original Russian abstract.

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SOV/133-59-2-20/26

AUTHORS: Merlina, A.V. and Borzdyka, A.M.

TITLE: The Structural Stability and Properties of Heat Resistant Chromium Steels (Stabil'nost' struktury i svoystv teploustoychivykh khromistykh staley)

PERIODICAL: Stal', 1959, Nr 2, pp 160-165 (USSR)

ABSTRACT: The influence of a prolonged action of high temperature and stresses (or of temperature alone) on the microstructure and the distribution of alloying elements between solid solutions and carbide phases as well as on the mechanical properties (including creep) of chromium steels was investigated. Steels containing 3, 5-6 and 12% of chromium and additionally alloyed with molybdenum, tungsten, vanadium and niobium (table 1) were studied. The investigated steels with 3% of chromium can be used for tubes operating at high pressures and temperatures up to 500°C (in particular cases in the atmosphere of hydrogen) and steels with higher chromium content may operate in strongly corrosive media. The results of analysis of the carbide phase of steels with 3% of chromium determined after hardening and annealing and after creep tests are shown in table 2, the microstructure and creep curves in

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The Structural Stability and Properties of Heat Resistant Chromium Steels

figures 1 and 2 respectively. Similar data on the carbide phase for steels containing 5-6% chromium are given in table 3 and for steels with 12% chromium in table 4. The dependence of hardness H_V and impact strength on the duration of heating of steels Kh5VF at 500°C and Kh5MVF and Kh5MVBF at 560°C are shown in figures 3 and 4 respectively. It is concluded that: 1) the retention of heat resistant properties of the chromium steels investigated, under service conditions depends on their structural stability, directly related with the thermal stability of the carbide phase and on the toughness of the solid solution. The presence of thermally stable finely dispersed and uniformly distributed vanadium carbide (in steel Kh3MVF) particularly together with niobium carbide (steel Kh3MVFB) effectively increases the stability of structure and properties; 2) a lower structural stability and insufficient heat resistance of steels with 5% chromium can be explained by the predominance in the carbide phase of chromium carbide of

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The Structural Stability and Properties of Heat Resistant Chromium Steels

a type (Cr, Fe, W Mo)$_7C_3$, the thermal stability of which is insufficient, particularly at 500°C; 3) in steels containing 12% of chromium the main component of the carbide phase is chromium carbide of a type (Cr, Fe, W Mo)$_{23}C_6$ the thermal stability of which is higher than that of carbide of the type Cr_7C_3. In this group of steels the highest stability of structure and properties has Kh12MVBF steel, the niobium content of which is completely transferred to the carbide phase with a corresponding decrease in chromium carbide. In this way a decrease in the content of chromium, tungsten and molybdenum in the solid solution of the steel is prevented. There are 4 figures, 4 tables and 5 references of which 4 are Soviet and 1 English.

ASSOCIATION: TsNIIChM

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SOV/129-59-5-10/17

AUTHORS: Cand.Tech.Sci. Z.N. Petropavlovskaya; Dr.Tech.Sci. A.M. Borzdyka; Engineer A.V. Merlina

TITLE: Relaxation Stability of High Chromium Steel (Relaksatsionnaya stoykost' vysokokhromistoy stali)

PERIODICAL: Metallovedeniye i Termicheskaya Obrabotka Metallov, 1959, Nr 5, pp 45-50 + 1 plate (USSR)

ABSTRACT: The results are described of investigations of the process of relaxation of high chromium semi-ferritic steels (0.10 - 0.15% C; 10 - 12% Cr; 0.3 - 0.6% Mo) as a function of their degree of alloying and their phase state. The work hardening was effected by alloying of the base alloy with vanadium, tungsten, molybdenum, niobium and nickel. To detect as fully as possible the influence of these elements on the relaxation stability, the experimental melts were sub-divided into four groups, see Table 1. The metal was produced in a 50 kg capacity induction furnace with a basic lining from a charge consisting of chemical iron and pure ferro-alloys. The relaxation tests lasted 1500 to 4000 hours and these were carried out at 550 to 565 °C with an initial specific load of 25 to 30 kg/mm^2. The relaxation stability was

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Relaxation Stability of High Chromium Steel

judged from the residual stress after 4000 hours. For most heats this magnitude was determined experimentally. The influence of individual alloying elements on the relaxation stability can be judged from the graphs (Figs 1-4). Table 2 gives the phase composition of the steel from the melts investigated in the experiments. The following conclusions are arrived at: 1) Additional alloying of steel, containing 0.15% C, 12% Cr, and 0.5% Mo, with vanadium (up to 0.4%), tungsten (up to 0.8%) and niobium (up to 0.8%), introduced separately or together, brings about an increase of the relaxation stability of the base alloy. From the point of view of increasing the resistance to relaxation the most effective measure is to add simultaneously all the three elements. 2) The relaxation stability of the investigated steels depends to a great extent on the quantitative ratio of the structural components (sorbite and ferrite) and also on the degree of hardening and the stability of ferrite. In order to obtain a high relaxation stability, alloying of high chromium steel should ensure a high strength of the ferrite and the highest stability of the ferrite and

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Relaxation Stability of High Chromium Steel

carbide phases. 3) For "fastening" components (fittings) which are required to have satisfactory relaxation properties at 565 oC, steels of the following two compositions are recommended: (1) 0.2% C; 12% Cr; 0.8% Mo; 0.3% V; 0.8% Nb; and (2) 0.2% C; 12% Cr; 0.5% Mo; 0.4% V; 0.5% W and 0.5% Nb.

Card 3/3 There are 4 figures, 2 tables and 6 references, 4 of which are Soviet and 2 English.

ASSOCIATIONS: TsNIITMASh and TsNIIChM

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1P.1150

AUTHORS: Borzdyka, A. M., Petropavlovskaya, Z. N., Merlina, A. V.

TITLE: Relaxation-resistant chromium steel for fasteners of steam turbines

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 53 - 54, abstract 4I316 (V sb. "Issled. novykh zharoprochn. splavov dlya energetiki". Moscow, Mashgiz, 1961, 141 - 150)

TEXT: As a fastening material for steam turbines with the temperature of steam of 565 and 580°C, 20Х12МВБФ (20Kh12MVBF) Cr-steel can be used. This steel is recommended for fastening steam turbine and boiler elements made of ЭИ802 (EI802), 15Х11Л (15Kh11L) and other type steels. 20Kh12MVBF steel after oil hardening at 1,150°C and tempering at 680 - 700°C has a sufficiently high relaxation resistance and a long-time strength at 550 - 580°C and shows no sensitivity to notches. The residual stress value after 10,000-hour testing of ring samples of this steel at 565°C corresponds to the technical conditions for fastening materials and is equal to 10 kg/mm^2 at σ_0 = 30 kg/mm^2 and at 580°C it amounts to 9.5 kg/mm^2.

T. Rumyantseva

[Abstracter's note: Complete translation]

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S/028/61/000/011/004/004
D221/D301

AUTHORS: Balakina, I.A., and Borzdyka, A.M.

TITLE: Rods and strips of heat resisting steels

PERIODICAL: Standartizatsiya, 25. no. 11, 1961, 34-37

TEXT: The Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (TSNIICHM) (Central Scientific Research Institute of Ferrous Metallurgy) developed a standard for rods and strips of heat resisting steel. It is based on ГОСТ (GOST) 5632-61 and other data, and covers pearlitic, martensitic, martensitic-ferritic and austenitic classes. The first class includes 12Х1МФ (12Kh1MF) and other steels containing 0.9 to 3.3% of chromium, 0.15 - 1.1% of molybdenum and vanadium, and 0.3-0.5% of tungsten. The martensitic class averages 4.4-12% chromium with additions of nickel, tungsten, molybdenum and vanadium, covering steels of mark Х5М (Kh5M) etc. The steels containing 5-15% of ferrite in their structure are separated into the martensitic-ferritic class, containing 11-13% chromium with other additions. The

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majority of heat resisting steels belong to the austenitic class with 7-27% chromium and nickel each, as well as other additions. The norms of long service and creep form the most important characteristic of these high quality steels. The project of the standard also deals with the mechanical properties of metal at normal temperatures which are determined on specimens of thermally treated blanks. Some characteristics of certain marks of steel are modified in accordance with the technical conditions in force at present, or by the first draft of the project. Additional examination of rods on the demand of customers is envisaged by the new standard, although they are not provided by GOST. This covers hair cracks, presence of the alpha phase etc. The methods of investigating resistance to scale formation, grain sizes, tendency to inter-crystalline corrosion and non-metallic inclusions are covered by GOST 6130-52, 5639-51 and 1778-57. The standard allows a mutual agreement between makers and consumers of steel for the above, owing to lack of unified norms of verification. The existing standards will be in force as far as forms, sizes and allowances for hot rolled and forged rods as well as strips are concerned. For dimensions exceeding 200 mm,

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the project envisages mutual agreement of steel producers and users. The depth of grinding-off the defects is similar to the standard for stainless and acid resisting rods. For sizes of 141-200 mm it corresponds to GOST 5949-61. There are 6 figures.

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S/032/61/027/006/018/016
B124/B203

AUTHOR: Borzdyka, Doctor of Technical Sciences

TITLE: Standardization of methods for high-temperature tensile-strength tests

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 6, 1961, 764

TEXT: A tentative GOST standard concerning the methods of short-termed tensile-strength tests at elevated temperatures, worked out by a group of collaborators of the Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (TsNIIChM) (Central Scientific Research Institute of Ferrous Metallurgy), was submitted for judgment to the Vsesoyuznyy komitet standartov (All-Union Committee on Standards) at the end of 1960. After previous judgment at a conference convened by the TsNIIChM in July 1960, the draft was accurately formulated. The present paper particularly deals with the problem of permissible test rates, which had not been solved at the conference. At normal temperature, ГОСТ 1497-42 (GOST 1497-42) specifies a stretching rate for the specimen of up to 4 mm/min, whereas at high temperatures a rate of 1 - 2.5 mm/min is used

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which is ensured by using the ИМ-4Р (IM-4R) and ИМ-12Р (IM-12R) test machines whose heads move at a velocity of 1.2 - 2 mm/min. The stretching and load-application rates recommended and actually used for specimens in tensile-strength tests (in mm/min) are: Ordinary tests: according to GOST 1497-42 standards (l = 100 mm) ..... $\leqslant$ 4
High-temperature tests: optimum values of v_ε ..... 1 - 2
according to ASTM standards (l = 50 mm) ..... $\leqslant$ 2.5
according to СМИ-204 (3MI-204) standards (l = 50 mm) ..... 4 - 5
according to GOST draft (l = 50 mm) v_ε = 0.05 l 2.5
according to GOST draft (l = 50 mm) v_ε = 0.1 l 5.0
v_ε in the IM-4R, IM-12R machines ..... 1.2 - 2
The tentative GOST standard specifies the stretching rate as dependent on the calculated length l of the testpiece in mm. In the initial variant of the draft, the condition $v_\varepsilon' \leqslant 0.05$ l holds before the flow limit, and the condition $v_\varepsilon \leqslant 0.2$ l after it. This specification was criticized at the conference, and finally v_ε = (0.05 + 0.1)l introduced as upper limit which, however, gives too high testing rates. Here, too high values are obtained for the strength of steels, and the spread of data obtained at different laboratories increases, which detracts from

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Standardization of methods ... S/032/61/027/006/018/018
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the practical usability of short-termed stretching tests at elevated temperatures.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii im. I. P. Bardina (Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin)

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PHASE I BOOK EXPLOITATION SOV/6037

Borzdyka, Anatoliy Matveyevich

Metody goryachikh mekhanicheskikh ispytaniy metallov (Methods of Hot Mechanical Testing of Metals) 2d ed. rev. and enl., Moscow, Metallurgizdat, 1962. 488 p. Errata slip inserted. 5250 copies printed.

Ed.: G. V. Estulin; Ed. of Publishing House: A. L. Ozeretskaya; Tech. Ed.: M. K. Attopovich.

PURPOSE: This book is intended for engineering personnel of plant laboratories, scientific research institutes, and metallurgical and machine-building plants. It may also be useful to students at schools of higher education and tekhnikums.

COVERAGE: The book reviews various methods for the mechanical testing of metals at high temperatures under static conditions (tensile, torsion, bend, and hardness tests) or dynamic conditions (tensile and bend tests). Particular attention is

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given to creep, stress-rupture, relaxation, and fatigue tests. Machines and instruments used for hot tests are described, and concrete data are given concerning the testing procedure, particularly as it relates to the heating of specimens, the measurement of specimen temperature, and the determination of small deformations. The main principles governing the proper selection of test methods and the evaluation and practical utilization of obtained results are also discussed. No personalities are mentioned. There are 220 references, mostly Soviet.

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E193/E383

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AUTHOR: Borzdyka, A.M., Doctor of Technical Sciences

TITLE: Stress-relaxation in iron-nickel-chromium alloys at elevated temperatures

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no. 7, 1962, 24 - 26

TEXT: The object of the present investigation was to study the dependence of stress-relaxation on Fe-Cr-Ni alloys at elevated temperatures on their composition and on the presence of small additions of alloying elements. The relaxation (stress/time) curves were constructed for ring specimens (I.A. Oding, Vestnik mashinostroyeniya, no. 5-10, 1946) tested at 600 °C. To ensure that all the specimens had the same grain size they were quenched from various temperatures, depending on the composition of the alloy. The Cr content of the alloys was constant at 20%, the Ni content varying between 9 and 77%. The results obtained and the conclusions reached can be summarized as follows:
1) The variation in the concentration of the main components (Fe, Cr, Ni) of austenitic Fe-Ni-Cr alloys has little effect on

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their relaxation stability at low intensities of the relaxation process, the effect of composition becoming more pronounced when the intensity of stress-relaxation increases. This is demonstrated in Fig. 2, where the residual stress σ_τ (kg/mm^2) at 600 °C is plotted against the Ni content of alloys containing 20% Cr; graphs a, E and B related, respectively, to specimens tested under the initial stress σ_o of 10, 15 and 20 kg/mm^2, curves 1, 2, 3 and 4 representing the concentration dependence of σ_o measured after 100, 500, 2 000 and 1 000 hours, respectively. The effect of concentration on hardness of the alloys studied is similar, as can be seen in Fig. 3, showing hardness (HB) isotherms constructed for 20, 500, 600 and 700 °C.

2) The relaxation stability of Fe-Ni-Cr alloys can be increased by small additions of tungsten, molybdenum or niobium. This is demonstrated in Fig. 4, where σ_τ (kg/mm^2) of Fe-Ni-Cr-W-Mo-Nb

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