Subject : USSR/Engineering AID P - 5256

Card 1/1 Pub. 11 - 7/15

Authors : Moychan, B. A., and L. A. Poznyak (Electrowelding Institute im. Paton)

Title : Radiographic inspection of intracrystalline heterogeneity of sulfur and phosphorus in welded seams.

Periodical : Avtom. svar., 9, 4, 76-87, Ap 1956

Abstract : The authors describe their radiographic research on the dendritic heterogeneity of sulfur and phosphorus in ingots and seams. The effect of cooling rate is discussed. Two tables, 11 photos (radiograms) and 1 graph; Nine Russian references (1950-56) 1 American (1950).

Institution : As above

Submitted : No date

ASNIS, A.Te.; DEM'YANCHUK, A.S.; MOVCHAN, B.A.; POZNYAK, L.A.

More on the problem of carbon diffusion toward the surface of fused metal in oxyacetylene cutting. Avtom. svar. 9 no.6:83-86 N-D '56. (MIRA 10:3)

1. Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O.Patona. AN USSR.
(Gas welding and cutting) (Diffusion)

MOVCHAN, B.A.

Diffusion processes and chemical composition of the fusion zone in welded joints. Avtom. svar. 9 no.6:87-93 N-D '56. (MLRA 10:3)

1. Ordena Trudovogo Krasnogo Znameni Insitut elektrosvarki im. Ye.O.Patona AN USSR.

(Diffusion) (Metallurgical analysis) (Steel alloys--Welding)

MOVCHAN, B.A.; POSNYAK, L.A.

Investigating chemical heterogeneity of the fusion zone and layer heterogeneity in welded joints. Avtom. svar.9 no.6:94-96 N-D '56. (MLRA 10:3)

1. Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O.Patona AN USSR.
(Electric welding) (Diffusion)

Movchan, B. A.

USSR / Solid State Physics / Structural Crystallography E-4

Abs Jour : Ref Zhur - Fizika, No. 5, 1957 No.11596

Author : Movchan, B.A.
Inst : -Inst Electric Welding im. Ye. O. Paton AS UkrSSR
Title : Method of Contact X-ray Microphotography of Alloyed Steels and Alloys.

Orig Pub : Zarod. laboratoruja, 1956, 22, NoF, 817 - 820.

Abstract : A description of measures for improving the technique of X-ray microphotography. The unfavorable effect of the continuous spectrum is reduced by using a special X-ray tube with reduced intensity of this spectrum, and also by choosing the voltage at which the ratio of the intensity of the characteristic radiation to the intensity of the continuous spectrum is increased. For this purpose, a sharp-focus tube (constructed by B. Ya. Pines) is enployed, and the voltage on the tube is chosen experimentally in the

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USSR / Solid State Physics / Structural Crystallography E-4

Abs Jour : Ref Zhur - Fizika, No. 5, 1957 No. 11596

Abstract : range of 18 -- 22 kv to obtain maximum contrast. It is established that the thickness of the investigated plate should not be greater than any of the structural components (0.08 -- 0.10 mm in individual cases 0.3 mm). The form of radiation for each case and particularly for elements that are closely located in the Mendelev table, should be specially chosen. To investigate the irregularities in alloys of iron with respect to the chromium, it is recommended to employ iron radiation, to employ cobalt radiation for manganese, and chromium radiation for niobium and titanium. To refine the character of irregularities, it is recommended that separate X-ray photography be employed in several characteristic radiations. The method is recommended for the determination of the stratifecation in rolling, irregularities in the grain of cast and overheated steel, etc., with possible substitution for the method of autoradiography.

Card: 2/2

MOVCHAN, B.A.

Some characteristics of intercrystalline heterogeneity and chrystal structure of the weld joint in 1Kh18N9 chromium-nickel austenitic steel. Avtom.svar.10 no.4:75-82 Jl-Ag '57. (MIRA 10:10)

1. Ordena Trudovog Krasnogo Znameni Institut elektrosvarki imeni Ye.O.Patona Akademii nauk USSR.
(Chromium-nickel steel--Welding) (Metallography)

MOVCHAN B.A.

[redacted]

25(6) PHASE I BOOK EXPLOITATION SOV/2555

Nauchno-tekhnicheskoye obshchestvo priborostroitel'noy promyshlennosti. Ukrainskoye respublikanskoye pravleniye

Novyye metody kontrolya i defektoskopii v mashinostroyenii i priborostroyenii [doklady Respublikanskoy konferentsii] (New Methods of Inspection and Flaw Detection in the Machinery and Instrument-manufacturing Industries [Reports of the Conference Held at Kiyev, 1956]) Kiyev, Gostekhizdat USSR, 1958. 264 p. 4,700 copies printed

Sponsoring Agency: Akademiya nauk USSR.

Ed.: A. Amelin; Tech. Ed.: P. Patsalyuk; Editorial Board: I.I. Greben', B.D. Grozin, A.Z. Zhmudskiy, G.N. Savin (Resp. Ed.), I.D. Faynerman (Dep. Resp. Ed.), and A.A. Shishlovskiy.

PURPOSE: This book is intended for engineers, scientific workers, and technicians dealing with problems of inspection and flaw detection.

COVERAGE: This is a collection of scientific papers presented at a conference sponsored by the Academy of Sciences, UkrSSR, and the Nauchno-tekhnicheskoye obshchestvo priborostroitel'noy promyshlennosti, Ukrainskoye pravleniye (Ukrainian Branch, Scientific and Technical Society of the Instrument-manufacturing Industry). The papers deal with modern methods of inspection and flaw detection used in the machinery- and instrument-manufacturing industries. The subjects discussed include the use of electron microscopes in the investigation of metal surfaces; X-ray, gamma-ray, luminescense, magnetic, and ultrasonic methods of flaw detection; use of radioactive isotopes; X-ray diffraction methods of metal analysis; and the use of interferometers for measuring length and thickness and determining the coefficient of linear thermal expansion. No personalities are mentioned. References follow several of the papers.

Bogdanov, V.I., Candidate of Technical Sciences, Novocherkasskiy politekhnicheskiy institut (Novocherkassk Polytechnical Institute). Selection of Radioactive Sources for Measuring Equipment 25

Movchan, B.A., Candidate of Technical Sciences, Institut elektrosvarki imeni Ye.O. Patona, Kiyev (Kiyev Electric Welding Institute imeni Ye.O. Paton). Use of Radioactive Isotopes in the Detection of Flaws in Welds 41

Zhmudskiy, A.Z., Doctor of Technical Sciences, Professor, Gosuniversitet imeni Shevchenko, Kiyev (Kiyev State University imeni Shevchenko). X-ray Diffraction Method of Inspecting Finished Parts 50

Card 3/9

AUTHOR: Movchan, B.A. (Kiyev)

SOV/24-58-4-23/39

TITLE: Peculiarities in the Distribution of Impurities Between Solid and Liquid Phases in Alloys (Ob osobennostyakh raspredeleniya primesi mezhdu tverdymi i zhidkimi fazami v splavakh)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 122 - 123 (USSR)

ABSTRACT: The distribution of Ag, Cu and Zn between solid and liquid phases of binary Al alloys was studied by an X-ray method. High-purity alloys of the following composition were prepared: Al-Ag 4.8%, Ag 7.30%; Al-Cu 3.2%, Cu 8.3%; Al-Zn 4.98%, 10.10% and 14.79% Zn. These were forged, homogenised, held at temperatures above the solidus for 2 hours and quenched. Cu, Zn and Ag have a higher X-ray absorption coefficient than Al. Hence, portions of phases rich in any one of the above elements appear as light coloured field on X-ray pictures. The liquid phases of the above alloys were found to contain a greater proportion of alloy element than the respective solid phases. In the boundaries between phases, however, there is a layer, 2 to 4 μ wide, with a higher alloy-element

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Peculiarities in the Distribution of Impurities Between Solid and Liquid Phases in Alloys

content than in the respective molten phase. There is also a very high alloy-element concentration in those portions of a two-phase alloy where the molten phase is contained in a narrow gap between two adjacent solid phases. It was found that the alloy-element content in such gaps is 100 to 200% greater than in the respective molten phases. The area of these gaps in X-ray pictures is approximately 1% of the total area. During dendrite growth coring begins when the growing secondary (and higher-order) arms form a narrow gap which attracts alloy atoms. X-ray analysis shows that the concentration of the second component in the interstices of the above alloys, obtained by relatively slow crystallisation down to a temperature somewhat above the solidus line and subsequent quenching, may exceed the maximum alloy-element content in the liquid phase, as given by the phase diagram. This is due to peculiarities in concentration in narrow gaps. X-ray analysis has shown that in a number of cases a melt

Peculiarities in the Distribution of Impurities Between Solid and Liquid Phases in Alloys

which is considerably richer in alloy-element content than the remaining molten phase, penetrates into the cracks formed during solidification. This effect is particularly pronounced in alloys with a columnar grain structure, e.g. in peripheral zones of Al + 2.6% Cu ingots. An enriched melt penetrated into the initial crack. Subsequently, as the columnar crystals grow so the crack, filled with the enriched melt, grows. As a result "veins" or "strings" with a high alloy-element content form in the solidified metal. The peripheral zones of the ingot have a higher Cu content than the central zones, i.e. liquation in the reverse direction takes place. The above range of phenomena is associated with the existence of concentration layers at the boundaries between phases and concentration characteristics in the "gaps" under the conditions equilibrium and non-equilibrium coexistence of phases.

SOV/24-58-4-23/39

Peculiarities in the Distribution of Impurities Between Solid and Liquid Phases in Alloys

There are 4 figures and 6 references, 4 of which are Soviet and 2 English.

SUBMITTED: May 12, 1957

Card 4/4

AUTHOR: Gulyayev, B.B. SOV/24-58-4-37/39

TITLE: Conference on Crystallisation of Metals (Soveshchaniye po kristallizatsii metallov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 4, pp 153 - 155 (USSR)

ABSTRACT: This conference was held at the Institut mashinovedeniya AN SSSR (Institute of Mechanical Engineering of the Ac.Sc. USSR) on June 28-31, 1958. About 400 people participated and the participants included specialists in the fields of foundry, metallurgy, crystallography, physics, welding, heat, physical chemistry, mathematical physics and other related subjects. In addition to Soviet participants, foreign visitors included Professor D. Czikl (East Germany) and N.I. Chvorinov (Czechoslovakia). This conference on crystallisation of metals was the fourth conference relating to the general problem of the theory of foundry processes.

Crystallisation of Non-ferrous Metals. N.N. Belousov and A.A. Dodonov - in their paper "Investigation of the Crystallisation and the Properties of Non-ferrous Metals Under Conditions of Applying Pressure", presented results of experiments on producing castings which crystallise under pressure from all sides and piston pressure within a wide range of specific loads. The results of the investigation provide material for improving existing methods of applying pressure to influence the crystallisation of alloys. The influence of the conditions of crystallisation on the casting and mechanical properties of aluminium alloys, at normal and at elevated temperatures, were discussed in the papers of I.F. Kolobnev and A.Ye. Semenov. The results of investigations of the conditions of crystallisation of aluminium alloys during continuous casting were presented in the paper of Ye.D. Zakharov. N.L. Pokrovskiy and D.Ye. Ovsiyenko dealt with the features of crystallisation of various non-ferrous alloys and the physico-chemical phenomena accompanying this process.

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Crystallisation of Metals in the Welding Bath. The following papers were read: B.A. Movchan - "Investigation of the Features of the Microscopic Chemical Non-uniformity in Alloys"; G.L. Petrov - "Crystallisation and Chemical Non-uniformity in Weld Joints"; M.Kh. Shorshorov and V.S. Sedykh - "Influence of Non-uniformities of Crystallisation in the Weld Bath on the Formation of Hot Cracks".

Crystallisation of Metals in an Ultrasonics Field. The following papers were read: Member of the Ac.Sc. Belorussian SSR N.N. Sirota, Ye.L. Lekhtblad and E.M. Smolyarenko - "Crystallisation of Metals and Alloys in an Ultrasonics Field"; I.I. Teumin - "Influence of Elastic Oscillations on the Processes of Crystallisation and the technological properties of Alloys"; L.L. Silin and A.A. Yerokhin - "Effect of Ultrasonics on Crystallising Metal in the Weld Bath".

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SOV/24-58-10-20/34

AUTHOR: Movchan, B. A. (Kiyev)

TITLE: Polygonisation of Cast Metals and Alloys (Poligonizatsiya litykh metallov i splavov)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, 1958, Nr 10, pp 122-123 + 1 plate (USSR)

ABSTRACT: Various theories exist as to the shape and size of primary crystallites in cast metals (Refs.1, 2, 3, 4). The author of this paper has shown that a change of shape of primary crystallites occurs even in metals and alloys which do not undergo a phase transformation. Pure nickel and copper ingots weighing 500 g each were melted in a laboratory vacuum furnace and slowly cooled at a rate of 2 to 3°C per sec just after solidification. A mirror surface suitable for micro-examination was obtained. The cross-section of the ingots consisted of nearly equi-axed crystals, with somewhat elongated crystals at the periphery. Primary dendrites were visible at the ingot surfaces. The dendritic forms of growth on the ingot surface cross in random directions the new straight boundaries of nearly equi-axed crystallites (Fig.1). Very frequently a straight boundary in the ingot surface has the appearance of a micro-crack which narrows down into the depth of the specimen. Thin straight boundaries in the ingot cross-section reach, in the majority of cases, to the surface

Polygonisation of Cast Metals and Alloys

crossing the dendritic forms of growth. A similar change in shape of the primary crystallites occurs in synthetic binary and commercial multi-component alloys of the iron, nickel and copper base solid solution type which do not undergo a phase transformation during cooling. Fig.2 shows the micro-structure of an industrial ingot of stainless steel of the chromium austenitic type Kh25N20. Owing to the dendritic inhomogeneity, the micro-structure simultaneously fixes the primary dendrites and the boundaries of new crystallites. The breaking down of primary crystallites occurs immediately after completion of the primary crystallisation of a metal or alloy. The following characteristic peculiarities of the breaking down process are: 1) A change in shape of the primary dendrites occurs in alloys of the solid solution type with a narrow solidification range (see Fig.3). As the solidification range widens the breaking down of crystallites becomes less and less evident and finally ceases as the micro-defects and the dendritic inhomogeneity increase. In alloys with a

Polygonisation of Cast Metals and Alloys

large component content the boundaries of the new crystallites become very non-uniform in width and may stop entirely at individual micro-defects (Fig.4). As the concentration increases further, the breaking down of the primary crystallites ceases. 2) A change in the shape of primary (broken down) crystallites occurs on slow cooling from the solidification temperature of metals and alloys, as well as on fast cooling. 3) In metals and alloys with distinct textural growth, which is expressed by columnar crystallites with uniform orientation, new crystallites also possess columnar orientation. The new boundary can border onto a few primary crystallites. In the absence of a strict textural growth, new boundaries form crystallite shapes which are close to equi-axed. 4) There is no change in the shape of primary crystallites in 2-phase alloys in which the second phase forms during solidification or immediately after solidification. In most cases the boundary appears as an etched groove (Fig.5a). In some portions the boundary consists of a chain of etched grooves (Fig.5b) or possesses a more complicated structure. The indicated peculiarities of the grain structure of the new crystallites agree well with the dislocation model of the boundary of two different grains (Ref.6). There-

Polygonisation of Cast Metals and Alloys

fore, the point-like etch figures in the boundary, similar to those shown in Fig.5b, can be considered as the result of linear dislocations, which are perpendicular to the micro-specimen area, having come to the surface. The measured and calculated relative deflection angles for adjacent crystallites agree satisfactorily if the degree of disorientation is small. Figs.6a and 6b show the grain structure of a nickel ingot which can be considered as a combination of linear and screw-type dislocations. As the result of analysis, it can be said that in cast metals and solid solutions the movement and grouping of dislocations during cooling at high temperatures leads to the formation of new boundaries. In the presence of a sufficient quantity of micro-vacancies and other defects there is no change of shape of the primary crystallites. Thus, the above change of primary crystallites in cast metals and alloys can be classified as a process of polygonisation of cast metals and alloys as compared with the usual process of granulation of alloys as the result of

Polygonisation of Cast Metals and Alloys

phase transformations, straightening of boundaries and collective recrystallisation. It is quite possible that the polygonisation process occurs also in high temperature monophase regions of alloys which at lower temperatures undergo phase transformations. There are 6 figures and 6 Soviet references.

SUBMITTED: May 14, 1958.

AUTHOR: Kovchan, P. .

TITLE: The olygonization of cast metals and alloys [illegible] (Iz litykh metallov i splavov)

PERIODICAL: Doklady Akademii nauk SSSR, 1956, Vol. 110, No 3, pp. [illegible] (USSR)

ABSTRACT: According to observations made by the author in the case of primary crystals in cast metals and alloys, which undergo no phase transitions, changes. This change is connected with the imperfections of crystal structure. First, the shape of the primary crystallites and its change in casting of pure nickel and copper were investigated. The macro section of nickel castings had nearly coaxial or polyhedral elongated crystallites. In the local surface the primary dendrites were distinctly observable (as a result of the volume effect in crystallization). The boundaries of the grains on the surface of the casting intersect the boundaries of the new and nearly quite coaxial crystallites in various directions. In copper castings the boundaries of the new crystallites develop in a similar manner.

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SOV/20-120- -4/67

The Polygonization of Cast Metals and Alloys

of the shape of primary crystallites was observed in synthetic, binary, and industrial alloys with several components (of the type of solid solutions) on iron, copper, and nickel bases. These alloys had not been subjected to phase transitions during the process of cooling. Next, some particular features of this fracturing of primary crystals in metals and alloys were described. This process may be interpreted as one of polygonization of cast metals and alloys in contrast to the ordinary granulation of alloys by phase transformations, by the equalization of boundaries, and by recrystallization. There are 4 figures and 5 references, 3 of which are Soviet.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona Akademii nauk USSR (Institute of Electrical Welding imeni Ye. O. Paton of the Academy of Sciences, USSR)

PRESENTED: February 14, 1958, by B. Ye. Nekrasov, Member, Academy of Sciences, USSR

SUBMITTED: August 14, 1957

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MOVCHAN, Boris Alekseyevich [Movchan, B.O.]; STETSENKO, Vsevolod Ivanovich; NIMCHUNOVA, O., red.; PATSALYUK, P., tekhn.red.

[Technical uses of radioactive isotopes] Radioaktyvni izotopy v tekhnitsi. Kyiv, Derzh.vyd-vo tekhn.lit-ry URSR, 1959. 183 p. (MIRA 13:1)
(Radioisotopes--Industrial applications)

18(7,7) SOV/125-13-6-7/14

AUTHOR: Movchan, B.A., Candidate of Technical Sciences

TITLE: On the Reasons and the Mechanism of Hot Cracking in Welds With One Phase Austenite Structure

PERIODICAL: Avtomaticheskaya svarka, 1959, Vol 13, Nr 6, (95) pp 49-66 (USSR)

Info: 2 Mar 61

ABSTRACT: The author states, that a strict theory of hot cracking in welds with one phase austenite structure does not exist. Soviet and foreign specialists are disagreeing on the working hypotheses on the reason and mechanism of hot cracking. The Soviet specialists B.M. Rabkin, I.I. Frumir (Ref.1) and later on B.I. Medovar (Ref. 2), N.F. Lashko and S.V. Lashko-Avakyan (Ref. 3) and others found a basic regularity of hot brittleness. These regularities are established by the school of A. A. Bochvar (Ref. 4, 5 and others). The principal factors of intercrystal destruction show more complete the hypotheses of intercrystal durability, formulated by N.N. Prokhorov(Ref. 9,10). The author divides the

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On the Reasons and the Mechanism of Hot Cracking in Welds with One Phase Austenite Structutre

whole problem of the welds hot cracking into two parts 1) Hot cracking in welds, which crystalize in one-phase austenite region and 2) hot cracking in welded joints, which crystalize developing a two-phase or more compound system. The author discusses the conclusions of P.I. Pruk (Ref. 36) and A.A. Popov on the quantity and quality of inner crystal heterogenity and on the structure and composition of intercrystal zones. The experiments on polygonization have shown that in cast metals and in one-phase alloys a change of crystallites without phase transformation takes place. (Ref. 31). This effect occurs immediately after final hardening. It was classified as polygonization of cast metals and alloys. F. Seitz (Ref. 34) prognosticates the possibility of accumulation of imperfections after hardening. The tested welds contained: 19-26% Ni, 16-18% Cr, 0.45-0.80% Mn, 0.65-0.85% Si, 0.1% C, 0.018-0.024% S, 0.025% P. The welding was done

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On the Reasons and the Mechanism of Hot Cracking in Welds with One Phase Austenite Structure

under flux type AN-26. The welding conditions were: I = 650 A; U = 36-38 V; V = 29 m/h. With the help of radioactive sulphur-isotopes, the structure of the crystallization front in welded joints of chrome nickel steel was investigated. The nickel contents of this steel were different, 10-25%. Also low carbon steel with 3.5% Ni was investigated. The welding conditions were: I = 750 - 800 A; U = 34-36 V; V = 27 m/h. The electrode wire was made of type Sv-08A with a diameter of 5 mm. In the center of the plate, where the welding took place, piece of radioactive metal was inserted. The insertion was prepared by a small ingot of the corresponding steel. A radioactive isotope of sulphur was brought in. While the welding arc goes over the insert, the liquid metal, which contains the radioactive sulphur, separates. That way two plies were formed. The upper one contained the radioactive isotope. The capillary effect at crystallization of alloys

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On the Reasons and the Mechanism of Hot Cracking in Welds with One-Phase Austenite Structure

was investigated. Two stages of macroscopical defects in one-phase welds must be distinguished: 1) The possibility of forming a center of intercrystal destruction at the limit of polygonization in that part of the "welding tub", which becomes hard, under the front of crystallization, which joins with the liquid part of the tub. 2) The possibility of germinating this cracking by some foreign substances during the process of the later development of the crystallization front. There are two possibilities to stabilize the welds of pure austenite structure against hot cracking: 1) Supplementary alloying of the weld with elements, which decrease the diffusion mobility of the atoms of the basic alloy. Molybdenum, Tungsten, Chrome etc. can be used. 2) Increasing the overheating of the welding tub. There are 13 photographs, 3 graphs and 43 references, 37 of which are Soviet, 5 English and 1 German

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SOV/125-13-6-7/14

On the Reasons and the Mechanism of Hot Cracking in Welds with One Phase Austenite Structure

ASSOCIATION: Ordena trudovogo krasnogo znameni institut elektrosvarki imeni Ye.O. Patona AN USSR (Institute of Electric Welding imeni Ye.O. Paton AS UkrSSR of the Order of the Red Banner of Labor)

SUBMITTED: March 3, 1959

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25(1,7) SOV/125-59-8-2/18

AUTHORS: Movchan, B.A., Rabkin, D.M., Gurevich, S.M., and Zagrebenyuk, S.D.

TITLE: Some Technological Features of Electron Beam Welding in a Vacuum

PERIODICAL: Avtomaticheskaya svarka, 1959, Nr 8, pp 12-17 (USSR)

ABSTRACT: This article describes an apparatus for electron beam welding in a vacuum developed at the Institut elektrosvarki imeni Ye.O. Patona (Institute of Electric Welding imeni Ye.O. Paton), and work done to determine the relation between parameters of the welding process and characteristics of the melt obtained. The authors first describe the IES-L1 laboratory device for electron beam welding in a vacuum, consisting of: 1) a vacuum chamber with rotating table and an external drive; 2) a vacuum system using a VN-461M lamellate-stator pump, a high-vacuum steam-oil pump TsVL-100, and type VIT-1 vacuum gauge; 3) electrical equipment consisting of step-up and filament transformers from a GKT-250 X-ray apparatus, a KRM-150 kenotron, LATR

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autotransformers, and control and measuring equipment. Construction and outfitting of the vacuum chamber is described in some detail. The half-wave kenotron rectifier is rated at a consumed power of up tp 1 kw. Voltage during welding can be varied in limits up to 10-15 kV; this range is below that at which X-ray radiation becomes a problem. Welding current up to 150 ma is available. Vacuum is no less than 2×10^{-4} mm of Hg. In the experimental chamber circular, junction, and over-lapping seams can be made. Welding speed is smoothly regulated from 2-28 m/hr. During experiments to determine the influence of the parameters of the process of electron beam welding in a vacuum on the melting of the basic metal, the relation between the depth and width of the weld and the amount of electron current, anode voltage (that between the cathode and welded object), welding speed and position of the cathode in relation to the plates being welded was studied. The basic metal used in the experiments was industrial titanium VT1. Fusing was

performed on a plate 5-6 mm thick under various welding conditions. Basic parameters of the process are given. Computation of the required degree of rarefaction in the chamber is outlined. A higher than usual vacuum - 2×10^{-4} mm of Hg - was used in these experiments to assure quality results. It is stated that at pressures higher than 3×10^{-3} mm of Hg the electronic process can easily become an ionic one. Results of the experiment are illustrated (Figs 5-8) and briefly outlined. It was established that an increase in current causes a noticeable increase in the depth and width of the weld. Voltage also has a significant influence on the melt of the basic metal. In contrast to electric arc welding, a voltage increase substantially increases the depth of the weld. The width and depth of the melt can also be controlled by varying the welding speed.

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Some Technological Features of Electron Beam Welding in a Vacuum

There are 1 photograph, 1 schematic diagram, 2 structural diagrams, 4 graphs and 3 references, 1 of which is Soviet and 2 English.

ASSOCIATION: Ordena trudovogo krasnogo znameni - Institut elektrosvarki imeni Ye.O. Patona (Order of the Red Banner of Labor - Institute of Electric Welding imeni Ye.O. Paton) AN USSR (AS Ukr SSR)

SUBMITTED: May 14, 1959

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18(7) SOV/32-25-1-29/51

AUTHOR: Movchan, B. A.

TITLE: Method of Quantitative Absorption Microradiography of Chemical Heterogeneity in Alloys (Metod absorbtsionnoy kolichestvennoy mikrorentgenografii khimicheskoy neodnorodnosti v splavakh)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 1, pp 68 - 70 (USSR)

ABSTRACT. The essence of the present method is that a standard lamina of the metal forming the basical component in the alloy is placed on the finely grained photofilm together with the lamina of the alloy to be investigated. Spots of various densities appear on the photofilm after developing. Basing on the film density, which depends on the passage of X-rays through the sample on the one hand, and on the standard sample on the other, an equation for the calculation of the solved component concentration can be obtained from some mathematical derivations. In case the alloy consists of three components, three different radiographs must be taken. By the use of the microphotometer MF-2 or MF-4 and a thirty-

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Method of Quantitative Absorption Microradiography of Chemical Heterogeneity in Alloys

SOV/32-25-1-29/51

fold magnification of the projector, the density of a plane of 0.005 x 0.1 mm can be determined. The X-ray tube BSV was employed and some elements were determined (Table). The photofilm NIKFI with an emulsion of the MK type features a linear section in the sensitometric curve within the density range of 0.3 - 1.0. The method was tested on binary and tertiary alloys with an aluminum and copper base and a determination accuracy of ± 10 - 15% was found. There is 1 table.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona Akademii nauk USSR (Institute for Electric Welding imeni Ye. O. Paton of the Academy of Sciences, UkrSSR)

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5(4)

AUTHORS: Movchan, B. A., Dzykovich, I. Ya. SOV/20-125-2-32/64

TITLE: On the Selective Penetration of Dissolved Elements From the Liquid Phase Into a Crack (Ob izbiratel'nom proniknovenii rastvorennykh elementov iz zhidkoy fazy v treshchinu)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 2, pp 354-355 (USSR) Info: 2 Dec 58

ABSTRACT: In the present paper direct determination of the concentration of the liquid enriched in the crack formed on the boundary between the phases is carried out. The experiments were carried out on aluminum-copper- and aluminum-zinc alloys, which had been produced from pure components (99.995 %). Carrying out of experiments is described on the basis of a schematical drawing. The authors operated by means of the quantitative and qualitative absorption-microradiography. The essential feature of microradiography is based on the simultaneous microradioscopy of the sample (small plate) to be investigated and of a pattern on a fine-granular film. The following photometrization of the microradiographic pictures makes it possible to determine the chemical composition of the

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given microstructure. The accuracy of the method of quantitative microradiography is $\pm(10 \div 15)\%$ of the quantity to be measured. According to the results determined by this method, the copper- and zinc-content in the crack is considerably higher than the average value of this content in the corresponding alloys. A microradiogram of a sample having a crack recorded by means of iron radiation is shown in form of a diagram and the results of the quantitative radiography are given in a table. In the cracks, which are in contact with liquid aluminum-copper alloys with 2 - 9 and 7.8 % copper the copper content is about equal to eutectic concentration. This also agrees well with the results obtained by metallographical analysis. The alloy filling the crack is of eutectic structure. With an increase of the zinc- and copper content in the respective alloys the tendency towards forming surface cracks diminishes. The selective penetration of the dissolved elements into the crack may be explained by a tendency towards establishing an equilibrium between the phases. The copper- and zinc-content in the cracks agrees within the error limits with the concentrations

On the Selective Penetration of Dissolved Elements From the Liquid Phase Into a Crack SOV/20-125-2-32/64

determined from the liquidus of the diagrams mentioned. There are 2 figures, 1 table, and 9 references, 8 of which are Soviet.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona Akademii nauk SSSR (Institute of Electric Welding imeni Ye. O. Paton of the Academy of Sciences, USSR)

PRESENTED: December 7, 1958 by A. A. Bochvar, Academician

SUBMITTED: December 2, 1958

Card 3/3

18.7200

~~25(1)~~

SOV/125-60-2-15/21

AUTHORS: Movchan, B.A. and Kushnirenko, B.N.

TITLE: The Welding of Austenite Steel 18 With Independent Filler Wire

PERIODICAL: Avtomaticheskaya svarka, 1960, Nr 2, pp 89-91 (USSR)

ABSTRACT: Information is given on the results of experiments with automatic welding under flux, using the automatic double-arc "DTS-24" welder and powder metal filler wire. The welder was slightly altered to separate the second welding head from the welding current circuit, thus making it "independent" and melting by the heat at the metal pool. The filler wire was kept 5 to 12-mm from the arc at a 40 to 45° angle to the electrode (see drawing). The following problems were studied: 1) The influence of decreased superheating on the crystalline structure, and the tendency of high alloy compositions of the "Kh16N18" and "Kh16N24" types to

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The Welding of Austenite Steel With Independent Filler Wire

form cracks. The feeding of neutral wire (empty tube or powder wire filled with CaF_2) into the tail part of the pool improved the crystalline structure. The number of hot cracks (their total length) decreased by 40 to 60%. 2) The summary effect of cooling the welding pool and modifying with the aid of modifiers (cerium, zirconium, calcium). Cerium decreased the columnar structure and nearly completely eliminated hot cracks in "Kh16N18" steel. Zirconium gave somewhat worse results. 3) The summary effect of cooling the welding bath and a supplementary alloying of the welds in austenitic high alloy steels with molybdenum and tungsten introduced into the "cold" part of the bath by means of a powder wire. It greatly influenced the crystalline structure, the crystal boundaries, and the tendency to form hot cracks. The critical content of molybdenum for "Kh16N18" and "Kh16N24" steel was found to be 1.4 to 1.6% and 2.3

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001135420011-3"

The Welding of Austenite Steel With Independent Filler Wire

to 2.5%. The polygonization was completely suppressed, the columnar structure became much finer, and hot cracks were absent. Experiments were also conducted in which the simultaneous effect of cooling, modification and allyoing were checked. In this case, the powder wire was filled with ferromolybdenum with a small addition of cerium. The experiments gave quite satisfactory results. The results of the experiments make it possible to recommend the described welding method for improving the crystalline structure, and for diminishing the tendency of the weld metal to form hot cracks. There is 1 diagram. 4

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MOVCHAN, B.A.

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S/135/60/000/010/001/015
A006/A001

1.2300 2208

AUTHORS: Bochvar, A. A., Academician, AS USSR, Rykalin, N. N., Corresponding Member of AS USSR, Prokhorov, N. N., Professor, Doctor of Technical Sciences, Novikov, I. I., Candidate of Technical Sciences, Movchan, B. A., Candidate of Technical Sciences

TITLE: On the Problem of "Hot" (Crystallization) Cracks

PERIODICAL: Svarochnoye proizvodstvo, 1960, No. 10, pp. 3-4

TEXT: Information is given on results of investigations made by various authors on the technological strength of metal against hot crack formation. The following basic points in the problem of crystallization cracks are stated: 1. In analysing the technological strength, two main peculiarities of the conditions in which this strength manifests itself during welding and casting processes must be taken into account: a) the technological strength appears during the cooling of the work when phase transformations in the metal and structural changes take place, b) the technological strength manifests itself under conditions of mutually equilibrated stresses, i. e. when stresses in the sense of local changes in the specific volume of the cooling metal are balanced

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by stresses arising in the adjacent zones. 2. Crystallization cracks arise in the crystallization range of the metal and may develop in the solid state during cooling. A sharply pronounced drop of ductility of the alloys, named the temperature range of brittleness, is observed in the "effective" crystallization range. The basic mechanism of plastic deformation in the liquid-solid state consists in the mutual displacement of crystallites. The upper limit of the "effective" crystallization range is the temperature of interlacing and coalescence of the dendrites; its lower limit is the temperature range of brittleness. When passing through this range, the deformation mechanism changes abruptly and plastic deformation of the crystallites develops intensively together with intercrystallite displacement. 3. The theory of the technological strength in welding and casting must be based on the comparison of processes of deformation and changes in ductility. The notion that the alloys are not ductile in solid-liquid state is not correct. The alloy being in solid-liquid state has, within the temperature range of brittleness, a ductility which is characterized by small values of relative elongation. It was experimentally established that the relative elongation of the alloy in the "effective" crystallization range was commensurable with the deformation in this zone. It is precisely the ductility of alloys in solid-liquid state that ensures the technological strength

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in welding and casting, and data on the ductility of the alloys in this state permit the evaluation of their technological strength. 4. The technological strength reserve in casting or welding depends on the correlation between the temperature range of brittleness, ductility in this range, and the intensity of elastic-plastic deformation increasing with dropping temperature. All these three values must be considered when evaluating the strength reserve. 5. Changes in crack sensitivity can be determined by one of the characteristics if the two others remain constant. 6. Cracks in casting may be filled up by hydrostatic pressure and capillary forces. 7. Factors determining the temperature range of brittleness ductility and the deformation rate are enumerated.

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MOVCHAN, Boris Alekseevich

MOVCHAN, B. A.

Doc Tech Sci - (diss) "Microscopic non-uniformity in cast alloys." Novosibirsk, 1961. 47 pp; with illustrations; (Academy of Sciences USSR, Siberian Division, Joint Academic Council for Physics-Mathematics and Technical Sciences); 220 copies; price not given; list of author's works on pp 41-43 (18 entries); (KL, 6-61 sup, 212)

MOVCHAN, Boris Alekseyevich; LUPANDIN, I.V., red.; MATUSEVICH, S.M., tekhn. red.

[Microscopic heterogeneity of cast alloys] Mikroskopicheskaia neodnorodnost' v litykh splavakh. Kiev, Gos. izd-vo tekhn. lit-ry USSR, 1962. 339 p. (MIRA 15:3)
(Alloys--Metallography)

69655
S/180/60/000/02/011/028
E111/E135

18.7520

AUTHOR: Movchan, B.A. (Kiyev)

TITLE: Concentration Layers at Inter-Phase Surfaces in the Crystallization of Alloys

Info: 23 Jun 59

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 2, pp 72-78 (USSR)

ABSTRACT: As was shown by the author in earlier work (Ref 1), the normal approach to the calculation of possible dendritic heterogeneity using equilibrium diagrams involves assumptions that make it unsatisfactory, for the study of microscopic distribution. The author now gives results of experiments with Al-Cu, Al-Zn, Al-Sn, Cu-Sn, Zn-Sn over wide concentration ranges and some Sn-Pb, Sn-Bi and Al-Ag alloys. These showed the peculiarities of distribution of components between phases associated with concentration changes at the inter-phase boundaries. For studying the distribution between solid and liquid phases in isothermal holding, forged, homogenized alloys were kept above the solidus temperature (controlled to ± 0.5°C) for 24 hours in air or in vacuum and then cooled under a water jet. With such heat treatment concentration layers

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Concentration Layers at Inter-Phase Surfaces in the Crystallization of Alloys

were detected by micro-X-radiography (Fig 1). Figs 2, 3 and 4 give for Al-Cu, Al-Zn and Al-Sn, respectively, the difference between the concentration of components in the capillary channels and in the bulk of liquid as functions of liquid-phase concentration: all the relations are similar, with a maximum corresponding to differences of about 19, 11 and 26%, respectively. For studying the influence of concentration layers on component distribution during non-uniform crystallization, partly-crystallized alloys above the solidus temperature were quenched with a water jet; the cooling rate and average speed of crystallization before quenching were determined from cooling curves obtained with a type MPO-2 oscillograph and 0.25 mm diameter chromel-alumel wire thermocouples. Fig 5 shows a microradiograph for Al-Cu (3.2% Cu) crystallized at 650-630 °C at 0.085 mm/sec. From this and similar studies of other alloys the author concludes that as soon as the growing dendrite axes from capillary channels selective penetration of components

Concentration Layers at Inter-Phase Surfaces in the Crystallization of Alloys

begins, forming concentration layers at the inter-phase boundary on isothermal holding; as dendrites divided by narrow inter-axial zones grow further enrichment occurs, and the final concentration can exceed that of the last portion of liquid as calculated from the equilibrium diagram (an example of this effect is tabulated for Al-Cu and Fig 6 gives the copper concentration in the last portion of liquid without and with allowance for capillary effects). The inter-axial spaces are a few microns wide and can have various crystal structures (Fig 7). Fig 8 shows a photometric curve of a micro-radiograph of Al-Cu (2.9% Cu) peaks corresponding to inter-axial areas. When the segregating component does not form concentration layers the enriched zones are of different, frequently spherical shape (Fig 9). With very pronounced enrichment non-equilibrium structures can be formed, e.g. eutectic. Such a non-equilibrium structure can also be produced by other heat treatment (Fig 10).

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E111/E135

Concentration Layers at Inter-Phase Surfaces in the Crystallization of Alloys

The author recommends further experiments to delineate possible equilibrium and kinetic effects at the inter-phase boundary under his experimental conditions. There are 10 figures, 1 table and 8 references, of which 6 are Soviet and 2 English.

Card
4/4

4

SUBMITTED: June 23, 1959

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

AUTHORS Movchan, B. A., and Dzykovich, I Ya

TITLE The possibility of influencing the distribution of crystal lattice defects in highly alloyed casting alloys

SOURCE Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam v 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 243–248

TEXT The authors tried to find out whether it were possible to avoid the formation of a mosaic structure in crystals of single phase casting alloys by increasing the rate of solidification and by decreasing the mobility of dislocations in the matrix of the solidified alloy. The data of X-ray and of metallographic analysis of X16H20 (Kh16N20) and X20H80 (Kh20N80) alloys, with and without additions of Mo and after various thermal processes, indicate possible ways of regulating the structure of casting alloys. A formula is given for the time at which the process of formation of the mosaic structure for preliminarly hardened alloys takes place $t = t_0 e^{\frac{U}{RT}}$ There are 4 figures and 2 tables

Card 1/1

S/135/62/000/004/004/016
A006/A101

1.Y300

AUTHOR: Movchan, B. A., Candidate of Technical Sciences

TITLE: The correlation of physical micro-heterogeneity and hot cracks in weld joints

PERIODICAL: Svarochnoye proizvodstvo, no. 4, 1962, 6-8

TEXT: The author analyzes chemical and physical micro-heterogeneity developing during crystallization. He discusses the arising of physical heterogeneity in non-equilibrium crystallization of weld joints. One of the extreme cases, is the appearance of hot cracks in single-phase alloys along the developing polygonization boundaries. This type of intercrystalline failure is in the first order connected with physical micro-heterogeneity of austenite type steels and alloys. For the purpose of eliminating the formation of hot cracks, metallurgical and technological means should be developed to reduce the total amount of defects in the crystal lattice, to inhibit their shift, and to prevent partially or fully the polygonization process. An effective inhibition of polygonization in single-phase weld joints of the austenite type can be achieved by reducing the diffusion mobility of atoms of the metallic base in the high

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The correlation of physical micro-heterogeneity ...

temperature range. This can be brought about by additional alloying of welds with elements which strengthen interatomic bonds and consequently increase the heat resistance of solid solutions with a face-centered cubic lattice. (The additional alloys can be chromium, tungsten, molybdenum, tantalum, rhenium and others). The author mentions a method developed by Movchan and Dzykovich (Ref.8) for rapidly determining the effect of alloying elements on the mobility of defects in the crystal lattice. The effect of additional alloying with Mn, W, Ta and Mo on the magnitude of activation energy of polygonization U for several alloys is given in the table below:

Composition of alloy	U in kcal/mole
X16-20 (Kh16N20) + 2.5% Mn	68.3
X16-20 (Kh16N20) + 2.5% W	70
X16-20 (Kh16N20) + 2.5% Mo	76
X13-35 (Kh13N35) + 5% Mo	76.5
X13-35 (Kh13N35) + 2.5% Ta	84
X20H80 (Kh20N80) + 10% Mo	75
X20H80 (Kh20N80) + 14% Mo	80

There are 3 figures, 1 table and 8 references: 6 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Institut elektrosvarki imeni Ye. O. Patona, AN USSR (Institute of Electric Welding imeni Ye. O. Paton, AS UkrSSR)

Card 2/2

S/125/60/000/009/004/017
A161/A130

AUTHOR: Movchan, B.A.

TITLE: Microheterogeneity of Welds

PERIODICAL: Avtomaticheskaya svarka, 1960, No. 9, pp. 24-32

Info 23 Apr 60

TEXT: The article presents the contents of a report read at a conference on the occasion of the 90th birth anniversary of Ye.O. Paton. The microscopic and chemical heterogeneity of weld metal and its effect is discussed with references to existing data (Ref. 1-17) and the means to control it are suggested. It had been proven that in experiments with scratched lines network on X16H20 (Kh16N20) steel welds with 2.4% Mo content, held in 500-600°C that polygonization developed during heating, a definite dependence exists between the polygonization start time and temperature and can be expressed as

$$t = t_0 e^{\frac{U}{RT}}$$

Card 1/5

Microheterogeneity of Welds

where u is the activation energy of the boundary "separation" (it is 76 kcal/mol for the Kh16N20 alloy with 2.4% Mo); T = isothermic soaking temperature (in absolute scale), R = a constant (R = 2 cal/mol).
This dependence is shown graphically for two alloys (Fig. 3) where u_1 and u_2 is the polygonization activation energy of the alloys, and the arrows indicate the minimum cooling rate at which no boundaries would "separate". Polygonization can be suppressed by two means: 1. by using faster cooling by means of a high-temperature range (but carefully choosing an optimum rate in order not to speed up polygonization by abruptly forming tension stresses), and 2. by additional alloying with elements raising the activation energy and braking the polygonization process fully or completely. It follows from data obtained by Swalin, Martin and Olson (Ref. 13) that tungsten and molybdenum have a braking effect on dislocations in the lattice of nickel alloys. Experiments with austenitic high-alloy steel confirmed this (Ref. 14, Shorshorov). In other experiments including author's own, 12-14% Mo in nichrome alloys were sufficient to prevent polygonization and raise the hot cracking resistance. Aluminum and titanium are not suitable for alloying;

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in the author's laboratory titanium and particularly aluminum in a quantity of 0.8 to 1.5% slightly raised the cracking tendency in steel. Apparently, atoms of chemical impurities (sulfur, phosphorus) in a solid solution grid bend portions of crystallites giving way to new dislocations (Ref. 16, 17). It can, therefore, be expected that their low content will reduce polygonization. A commercial nickel weld is an example. It had hot cracks. Clear polygonization boundaries could be seen in the microstructure (Fig. 5, a), and 0.010 - 0.012 % sulfur was revealed in a solid solution; the addition of cerium in a small quantity bound the sulfur in the liquid pool into fine disperse particles of cerium sulfide (Fig. 5, b), and the sulfur was practically absent in the solid solution and also in the polygonization boundaries. Another preventive means is the austenito-ferritic weld metal structure which prevents hot cracking and intercrystalline corrosion by radically changing the nature of physical heterogeneity. The following conclusions are made: 1. Nonequilibrous crystallization of the welding pool causes chemical and physical heterogeneity. 2. This heterogeneity strongly affects the strength of the weld metal in the process of its formation and the physical and chemical properties of welds in service. 3. There is a close relation between

S/125/60/000/009/004/017
A161/A130

Microheterogeneity of Welds

the chemical and physical microheterogeneity on the one side and the heat cycle, composition, magnitude and growth of tension stresses in welding process on the other. It is possible to control the chemical and physical microheterogeneity of welds in certain limits by controlling these factors. 4. Further studies of this correlation of factors are necessary. There are 6 figures and 17 references of which 13 are Soviet and 4 English.

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O. Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" of the Academy of Sciences of the UkrSSR)

SUBMITTED: April 23, 1960

Card 4/5

S/125/62/000/006/002/013
D040/D113

AUTHORS: Movchan, B.A., and Nerodenko, L.M.

TITLE: New data on crystallite boundaries in austenitic welds

PERIODICAL: Avtomaticheskaya svarka, no.6, 1962, 13-16

TEXT: The formation of polygonization boundaries was studied on specimens of welds on X16N20 (Kh16N20) steel during isothermic heating at temperatures between 500 and 700°C. Specimens were taken from butt welds in Kh16N20 steel with 2.5-2.6% Mo, and additionally alloyed with Mo by feeding alloying powder wire into the cold portion of the welding pool; this prevented polygonization and hot cracks. Microsections, prepared after soaking at different temperatures for different times, were studied metallographically. Gradual formation of boundary sections was observed using a heating electron beam in a vacuum, and the boundary pattern was the same as is usually revealed by electrolytic etching after heat treatment. Coordinate networks of fine scratches made on polished microsections and distorted in electron beam annealing showed local microturns and shifts proving that polygonization is connected with the regulation of dislocations. X-ray diffraction confirmed this. The observed regu-

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larities indicated that the time necessary for the start and end of the polygonization process in preliminarily fixed (quenched) alloys is

$$t = t_o e^{\frac{U}{RT}},$$

where U is the activation energy of polygonization depending on the chemical composition of the metal; t_o - a value depending on the cooling rate and the relative disorientation of adjacent parts of the metal; T - the temperature of isothermic annealing; R - a constant equal to 2 cal/mol. The activation energy of Kh16N20 steel reached 76,000 cal/mol. Conclusion: In order to reduce the diffusion mobility of atoms of the metal matrix in the high temperature range, so as to inhibit polygonization in single-phase austenitic welds, the welds should be additionally alloyed with elements strengthening the interatomic bond forces and hence increasing the refractoriness of solid solutions with a face-centered lattice. Such elements include chromium, tungsten, molybdenum, and tantalum. There are 4 figures.

S/125/62/000/006/002/013
D040/D113

New data on orystallite boundaries .....

ASSOCIATION: Ordena Trudovogo Krasnogo Znameni Institut elektrosvarki im. Ye.O.Patona AN USSR (Electric Welding Institute "Order of the Red Banner of Labor" im. Ye.O.Paton, AS UkrSSR)

SUBMITTED: September 9, 1961

Card 3/3

MOVCHAN, B.A.

AID Nr. 992-12 18 June

ELECTRON GUNS FOR ELECTRON-BEAM FURNACES (USSR)

Movchan, B. A., and A. V. Zlatin, Avtomaticheskaya svarka, no. 3, Mar 1963, 1-6. S/125/63/000/003/001/012

Two electron guns for electron-beam melting furnaces developed at the institute of Electric Welding iment Ye. O. Paton are described. The cathode system of each gun consists of 10 separate cathodes, all mounted in a circle on a common base, with all the filaments connected in series and heated from a common source. In the first design (Fig. 1) the cathodes (2) are mounted on a ring (3) resting on insulators (4) supported by the base (7). The accelerating electrode is a water-cooled copper cone (1) with apertures for the passage of the beams (6). The cone also protects the cathodes against spatter and metal vapors, but only when the melting point of the melted

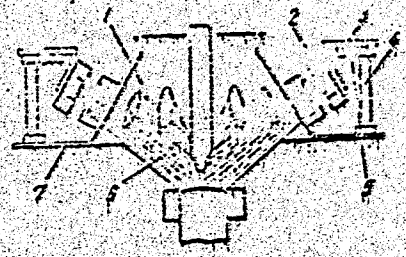

Fig. 1

Card 1/2

AID Nr. 992-12 18 June

ELECTRON GUNS FOR ELECTRON-BEAM FURNACES [Cont'd] S/125/63/000/003/001/012

niobium, for instance, the cathode life is approximately 40 hrs, but in melting tungsten and molybdenum, it is much shorter. The gun operates with an accelerating voltage of 12 to 14 kv and has an output of 100 to 120 kw. In the second design (Fig. 2) all the cathodes (4) are mounted on a common ring (2). Accelerating electrodes (3), one for each cathode, are arranged on another ring (1). Electromagnets (5) with shoes (6) deflect the beams (7) to the desired angle, which permits varying the anode current density over a wide range. This gun operates with the same accelerating voltage as the other and has the same output. With a cathode filament 1.5 mm in diameter the output can be increased to 100 to 180 kw. A modification of the second gun has only 6 elements and an electrostatic rather than electromagnetic deflecting system. [DV]

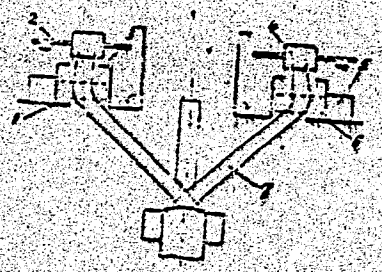

Fig. 2

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AID Nr. 988-10 12 June

ELECTRON-BEAM MELTING FURNACE (USSR)

Movchan, B. A., and A. L. Tikhonovskiy. Avtomaticheskaya svarka, no. 4, Apr 1963, 1-6. S/125/63/000/004/001/011

The Electric Welding Institute imeni Ye. O. Paton, Ukrainian Academy of Sciences, has designed and built two laboratory-size electron-beam melting furnaces, the ЭЛ-1 and ЭЛ-2. In the ЭЛ-1 the electron gun and the mold are mounted in a common vacuum chamber. The vacuum system has a pumping rate of 3500 to 4000 l/sec and can create a vacuum of $3 \cdot 10^{-6}$ mm Hg. The ЭЛ-1 furnace operates with an accelerating voltage of 12 to 14 kv. Ingots up to 60 mm in diameter and 500 mm long of metals including refractory, such as Nb, Mo, and Zr, and their alloys can be melted. Since the electron gun is in the same chamber with the mold, the metal vapors penetrate into the cathode zone and condense on the cathode elements and high-voltage insulation, requiring frequent cleaning of insulation and replacement of cathode elements, especially

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AID Nr. 983-10 12 June

ELECTRON-BEAM MELTING FURNACE [Cont'd] S/125/63/000/004/001/011

in the melting of refractory metals. This drawback has been eliminated in the Д-2 furnace, which has separate vacuum chambers for the gun and mold. Only narrow slots for the passage of electron beams connect the two chambers. Each chamber has an individual vacuum system. The service life of cathodes in this furnace runs into hundreds of hours and is determined only by the evaporation rate of the tungsten filaments. Ingots 30 to 100 mm in diameter and up to 450 mm long can be obtained.

[MS]

Card 2/2

ACCESSION NR: AT4013928 S/2659/63/010/000/0052/0057

AUTHOR: Movchan, B. A.; Dzy*kovich, I. Ya.; Nerodenko, L. M.

TITLE: A new approach to analysis of the mobility of imperfections in the crystal lattice in alloys

SOURCE: AN SSSR. Institut metallurgii. Issledovaniya po zharoprochny*m splavam, v. 10, 1963, 52-57

TOPIC TAGS: crystal lattice, crystal lattice imperfection, alloy, alloy crystal structure, crystal lattice imperfection mobility

ABSTRACT: High energy nuclear radiation, plastic deformation and rapid cooling of alloys from high temperatures (not exceeding the melting point) often lead to imperfections in the crystal lattice. The most important feature of the proposed approach to the analysis of the mobility of imperfections in solid solutions is the fact that the diffusive motion of the dislocations is considered in continuous connection with the chemical composition and, consequently, with the type of atomic action in the alloys. Data on the mobility of dislocations allow one tojudge the relative mechanical properties of alloys at high temperatures without employing complicated and lengthy tests. The described method of estimating the

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ACCESSION NR: AT4013928

diffusive mobility of dislocations on the basis of a wedge-shaped casting is distinguished by simplicity, rapid analysis and clarity and may be used with success for finding heat resistant alloys on the basis of solid solutions, for selecting satisfactory welding alloys, etc. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Institut Metallurgii AN SSSR (Metallurgical Institute AN SSSR)

SUBMITTED: 00 DATE ACQ: 27Feb64 ENCL: 00

SUB CODE: ML NO REF SOV: 005 OTHER: 001

Card 2/2

MOVCHAN, B.A., DZYKOVICH, I.Ya.

Rapid method of selecting one-phase alloys with satisfactory weldability and heat resistance. Avtom. svar. 16 no.2:34-40 F '63. (MIRA 16:4)

1. Institut eletrosvarki imeni Ye.O.Patona AN Ukr.SSR.
(Alloys—Metallography) (Welding—Testing)

L 56084-65 EWT(1)/EWT(m)/EPF(n)-2/EWG(m)/EPA(w)-2/T/EWP(t)/EWP(b) Pz-6/
ACCESSION NR: AR5015145 Pab-10 IJP(c) JD/AT UR/0137/65/000/005/B010/B010

SOURCE: Ref. zh. Metallurgiya, Abs. 5B56

AUTHOR: Movchan, B. A.; Zlotin, A. V.

TITLE: Present status and prospects for the application of electron beam heaters with linear cathodes

CITED SOURCE: Elektrotermiya. Nauchno-tekhn. sb., vyp. 42, 1964, 38-40

TOPIC TAGS: electron beam heating, linear cathode, electron gun, electron flow, melting, vacuum cast, casting

TRANSLATION: The article proposes several types of electron beam heaters based on the principle of an electron gun which forms a flat beam of electrons. Data on the use of these heaters in various industrial processes has confirmed the possibility of using them in a number of metallurgical processes, and also has made it possible to formulate a general approach to their fabrication and to point out a further extension of their field of application. Several schemes for the spatial arrangement of the linear elements are adduced. By changing the spatial arrangement of some of the electron guns (linear elements), it is possible, within

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ACCESSION NR: AR5015145

rather wide limits, to change the configuration of the heating zones and the distribution of the energy of the electron flows in these zones. Thus, there are shown a scheme for melting using a radial heater with a horizontal arrangement of elements, a scheme for casting in vacuum using a radial electron beam heater, etc. 7 figures. V. Pryanikova.

SUB CODE: EC, MM ENCL: 00

Card 2/2

PATON, B. Ye.; MOVCHAN, B. A.

"Electro Beam Radial Heaters for the Fusing of Metals."

Report to be submitted for the International Conference on Electron and Ion Beam Science and Technology in Toronto, Canada, 3-7 May 1964.

Kiev Institute of Electro Welding

L 43616-65 EEC(b)-2/EPF(c)/EPF(n)-2/EPR/EPA(s)-2/EWP(z)/EWA(c)/EWT(l)/EWT(m)/EWP(b)/T/EWA(d)/EWP(w)/EWP(v)/EWP(t) Pf-4/Ps-4/Pu-4/Pad IJP(c) GG/JD/HW/JG/WB/GS

ACCESSION NR: AT5008309 S/0000/64/000/000/0288/0300

AUTHOR: Movchan, B.A. (Doctor of technical sciences)

TITLE: Recent data on crystallite boundaries in cast metals and alloys

SOURCE: AN UkrSSR. Institut elektrosvarki. Novyye problemy svarochnoy tekhniki (New problems in welding technology). Kiev, Izd-vo Tekhnika, 1964, 288-300

TOPIC TAGS: metal crystal, crystal boundary, steel crystal, alloy crystal, alloy crystal structure, cast alloy, cast steel, molybdenum alloy, intercrystalline corrosion

ABSTRACT: The crystallite boundaries determine the properties of cast metals and alloys when forming ingots, castings or weld joints. Crystalline and hot cracks at high temperatures, embrittlement tendencies at usual temperatures, intercrystalline corrosion and other defects depend on the structure and properties of the crystallite boundaries. Analysis of test results indicates two kinds of crystal boundaries in cast metals and alloys: primary crystal boundaries caused by coalescence of dendritic or acicular crystals while hardening, and secondary boundaries formed after hardening by polygonization. The author considers the hypothesis of D.K. Chernov on dendritic crystallization, as well as that of Rosenheim and Tamman. In recent papers by the author and by A.A. Popov, enrichment of the steel was not confirmed at the place of coalescence of primary

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L 43616-65
ACCESSION NR: AT5008309

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crystallites. This is explained by redistribution of segregating admixtures at the boundary of the growing crystallite. Distribution of admixtures was observed in the zone of growth of primary crystallites when testing alloys of aluminum, copper, iron, nickel, niobium and molybdenum. The boundary of primary crystallites should be considered as the zone of mutual coalescence of primary crystallites of different orientation without enrichment of the layer between them. Manykinds of intercrystalline failures are connected with the secondary boundary formed after hardening. It is assumed that these boundaries are formed by polymorphic transformation or crystallization of the cast metal. A network of secondary boundaries of the solid solution is formed without polymorphic transformation. The dislocations move and are grouped after hardening of the metal, this being known as polygonization of cast metal and alloys. The boundary network is arbitrary in relation to the boundary zones of the primary crystallites. Polygonization takes place in all one-phase cast metals and alloys at high temeratures. Polymorphic (phase) transformations at lower temperatures may somewhat veil the nature of the polygonization boundaries. Due to polygonization, a macroscopic network of new boundaries is formed, appearing on macrosections as the macro grain boundaries.

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ACCESSION NR: AT5008309 3

The dislocation structure of secondary (polygonized) boundaries determines their structure and properties: enrichment by inclusions, loosening of the boundaries and formation of microscopic pores. Examples are given of phenomena observed at this time, such as the formation of crystal cracks in cast alloys (ingots, castings and weld joints) caused by small quantities of the enriched liquid phase in the interaxial and interdendritic spaces. Besides, hot cracks are formed in weld joints at the secondary (polygonization) boundaries under high temperatures with loosening of the considered boundaries. Moreover, a tendency to brittle intercrystalline failure is observed at normal temperatures for several medium-alloy or high-alloy (chromium) steels due to enrichment by dissolved admixtures (sulfur and phosphorus). A tendency is also observed towards intercrystalline corrosion of high-alloy one-phase chromium-nickel steel of the austenitic class. Brittle intercrystalline failure is observed at normal temperatures in pure molybdenum, tungsten and their alloys. On the basis of these examples, it is assumed that weakening or elimination of intercrystalline phenomena caused by the presence of secondary boundaries may be achieved either by preventing enrichment of the boundaries by admixtures or by partial or complete inhibition of the formation of secondary boundaries. The general method is purification of the metals and alloys by removing the admixtures. This is done by rapid cooling between 800 and 400C, and also by ensuring the growth of monocrystalline ingots. A more effective method of preventing the formation of secondary boundaries is separation of the high temperature secondary phase by introducing a certain quantity of alloying elements sufficient for a supersaturated solid solution at high

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ACCESSION NR: AT5008309

temperatures. Elimination of polygonization by the high temperature secondary phase in cast molybdenum alloys is an effective method for eliminating brittle fractures at normal temperature. Orig. art. has: 8 figures and 2 formulas.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona AN Ukr SSR (Electric Welding Institute, AN UkrSSR)

SUBMITTED: 05Nov64 ENCL: 00 SUB CODE: MM

NO REF SOV: 014 OTHER: 004

Card 4/4 CC

L 43851-65 EWT(1)/EWT(m)/EWA(d)/T/EWP(t)/EEC(b)-2/EWP(z)/EWA(c)/EWP(b) Pi-4.
IJP(c) [illegible]MJW/JD/GG(1,
ACCESSION NR: AP4048777 S/0126/64/018/004/0612/0616

28
27
B

AUTHOR: Movchan, B. A.; Nerodenko, L. M.

TITLE: Investigation of thermally activated motion of imperfections in the crystalline lattice of cast alloys

SOURCE: Fizika metallov i metallovedeniye, v. 18, no. 4, 1964, 612-616

TOPIC TAGS: thermally activated imperfection motion, dislocations, cast alloy, crystalline lattice imperfection, polygonization energy

ABSTRACT: A method is suggested for the study of the motion of imperfections in the crystalline lattice in cast alloys. The results of the analysis of the motion of imperfections are given resulting from the additional alloying elements and from applied stresses in high-alloyed iron base of the type X17N17 and X15N37 at temperatures higher than 0.45 T, where T is the melting temperature. The authors conclude that the motion of the imperfections which is thermally activated is realized through the creep of dislocations. The activation energy of poly-

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L 43851-65
ACCESSION NR: AP4048777

gonization is found to be equal to that of the continuous toughness of the alloys. Orig. art. has: 4 figures and 1 table.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona AN UkrSSR (Institute of Electric Welding, AN UkrSSR)

SUBMITTED: 14Sep63 ENCL: 00 SUB CODE: SS, MM

NR REF SOV: 004 OTHER: 001

Card 2/2

L 16302-65 EWT(m)/EWP(w)/EWA(d)/EWP(t)/T/EWP(b) Pad/Pu-4 IJP(c)/ASD(m)-3 JD/
ACCESSION NR: AP4045903 MJW/JG/JXT(cz) S/0021/64/000/009/1179/1182

AUTHOR: Movchan, B. A.; Nerodenko, L. M.

TITLE: Mutual relationship between the heated-activated movement of dislocations and the mechanical properties of alloys

SOURCE: AN UkrRSR. Dopovidi, no. 9, 1964, 1179-1182

TOPIC TAGS: heat resistant alloy, iron chromium nickel alloy, alloy microstructure dislocation, heat activated dislocation movement, microstructure polygonization, alloy mechanical property, polygonization effect

ABSTRACT: The heat-activated movement of dislocations in cast heat-resistant Fe-Cr-Ni alloys of the Kh17N117 and Kh15N135 types with additions of Mn, W, or Mo has been investigated by a new method based on observing a partial or complete formation of dislocations into a polygonization boundary in the alloy microstructure. The length of the portion of the wedge-shaped specimen, cast in a water-cooled copper mold, which has a dendrite structure without polygonization boundaries was a qualitative characteristic of the movement of dis-

* [Should be Kh17N12]
** [Should be Kh15N25]

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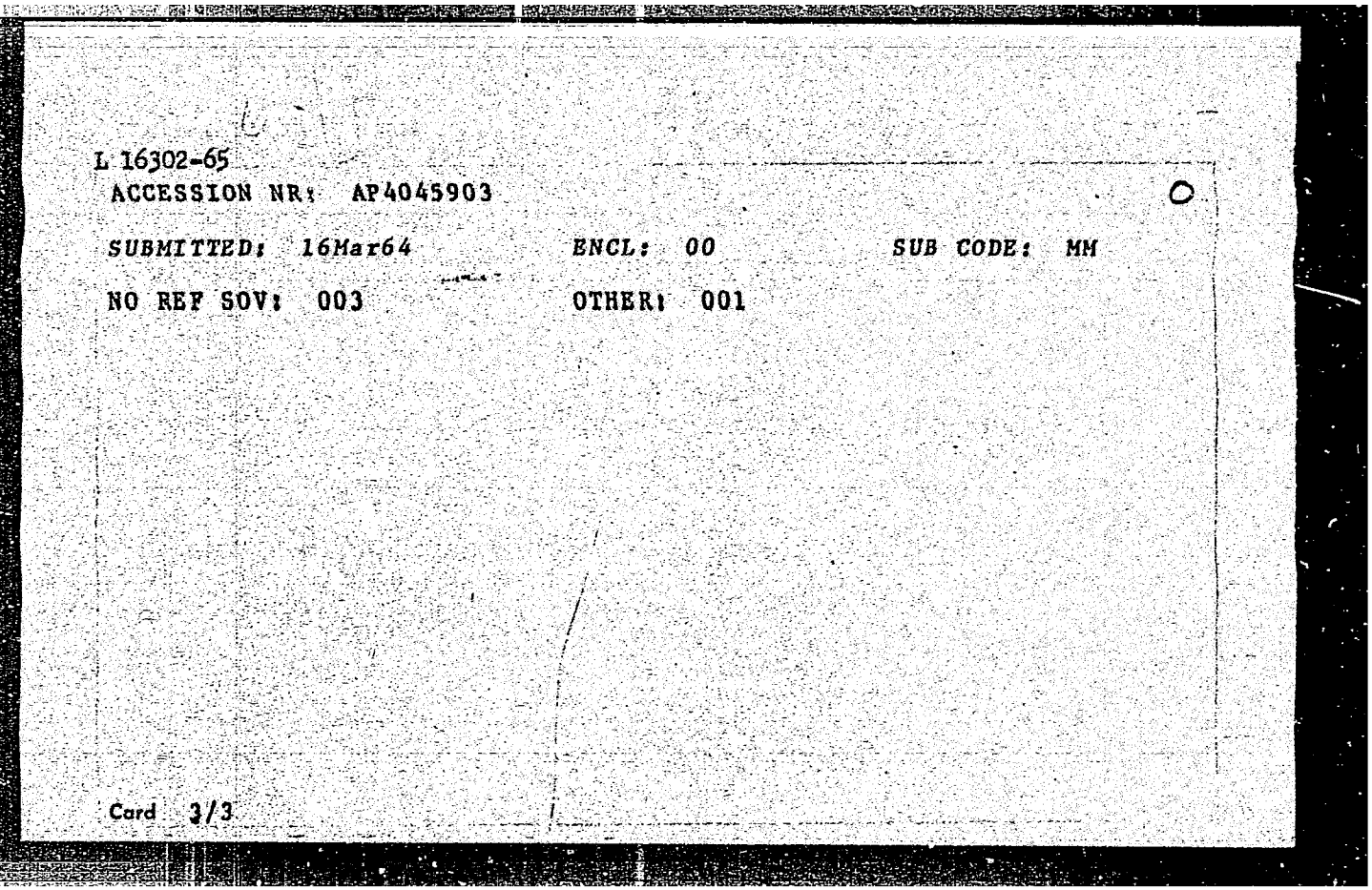
locations, and hence, of the physicomechanical properties of metals and alloys, particularly at elevated temperatures. Experiments showed that, in the alloys investigated, the movement of dislocations is most effectively retarded by the addition of Mn, W, and Mo, in that order. Creep tests at temperatures of about 0.45 of the melting temperature showed that the elements which slow down the movement of dislocations (retard polygonization) increase the rupture life of the alloys. The quantitative data on the above relationships were determined by comparing the activation energy of the polygonization, high-temperature rupture, and creep processes, resulting from additions in various amounts of Mn, W, or Mo. These data agreed closely with one another. Thus, the data on the movement of dislocations obtained by analyzing the polygonization process make it possible to determine the relative level of the high-temperature strength of an alloy without the usual mechanical tests. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Institut electrosvaryuvannya AN USSR (Electric Welding Institute, AN UkrSSR)



L 16302-65
ACCESSION NR: AP4045903

SUBMITTED: 16Mar64 ENCL: 00 SUB CODE: MM

NO REF SOV: 003 OTHER: 001

Card 3/3

L 25304-65 EPA(s)-2/EWT(m)/EPF(n)-2/EWP(t)/EPA(bb)-2/EWP(b) Pt-10/Pu-4
IJP(c) JD/JG

ACCESSION NR: AP5004550 S/0030/65/000/001/0025/0029

AUTHOR: Paton, B. Ye. (Academician); Movchan, B. A. (Corresponding member AN UkrSSR)

TITLE: Electron beam in the modern vacuum metallurgy

SOURCE: AN SSSR. Vestnik, no. 1, 1965, 25-29

TOPIC TAGS: electron beam melting, metal melting, electron beam furnace

ABSTRACT: The Electric Welding Institute, Academy of Sciences UkrSSR, has developed an electron-beam furnace with several electron guns arranged in a circle around the mold so that some beams are focused on the melted billet and some on the surface of the metal in the mold to keep it in a molten state. The melting and refining are divided into four stages: 1) degassing of the billet in solid state; 2) removal of oxygen, hydrogen, and nitrogen during the formation and the fall of the metal droplets into the mold; 3) further removal of impurities from the metal in the mold under high vacuum; 4) additional removal of impurities by directional crystallization, achieved by pulling the ingot at a rate of 1 mm/min or less. Electron-beam melting of vacuum arc-melted niobium reduced the gas content from the initial 0.03% O_2, 0.01% N_2, and 0.001% H_2 to 0.001% O_2, 0.004% N_2, and

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ACCESSION NR: AP5004550

0.0001% H_2. The initial tantalum content of 0.1% O_2, 0.04% N_2, and 0.05% H_2 was reduced to 0.0003% O_2, 0.001% N_2, and 0.0001% H_2. Electron-beam melting increased the ductility and lowered the hardness and strength of nickel. It also improved the corrosion resistance of tantalum, niobium, and, especially, of nickel and zirconium. Orig. art. has: 2 tables and 2 figures. [ND]

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: IE, MM

NO REF SOV: 000 OTHER: 000 ATD PRESS: 3181

Card 2/2

L 1439-66 EWT(m)/EPF(c)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/ETC(m) MJW/JD/WW/WB

ACCESSION NR: AP5022405 UR/0369/65/000/004/0477/0480

AUTHOR: Yefimenko, Yu. M.; Kuslitskiy, A. B.; Chaban, D. V.; Karpenko, G. V.; Movchan, B. A.

TITLE: Effect of the electron beam smelting on properties of the ShKh15 ball bearing steel

SOURCE: Fiziko-khimicheskaya mekhanika materialov, no. 4, 1965, 477-480

TOPIC TAGS: electron beam, ball bearing, smelting furnace

ABSTRACT: The effect of electron beam smelting on mechanical properties of the ShKh15 ball bearing steel was studied in order to compare the effectiveness of this technique with the effectiveness of the vacuum and slag smelting techniques. The electron beam smelting was conducted in a U-143 unit under $5 \cdot 10^{-4}$-$5 \cdot 10^{-3}$ mm Hg. As a result of this smelting treatment the oxygen content dropped from 0.0040 to 0.0007%, nitrogen from 0.007 to 0.0013%, hydrogen from 0.0001 to 0.00004%, SiO_2 from 0.0008 to 0.0004%, Al_2O_3 from 0.0270 to 0.0018%, FeO from 0.0007 to 0.0001%, and CaO from 0.0005 to 0.0001%. Electron beam smelted steel improved: resistance to cyclic deformation, corrosion resistance, and fatigue limit (33% increase).

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L 1439-66

ACCESSION NR: AP5022405

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The mechanical strength of ShKh15 steel (σ in kg/mm^2) as a function of frequency of cyclic deformation (in millions of cycles) N, is shown in fig. 1 of the Enclosure. The corrosion resistance of ShKh15 steel in 53% H_2SO_4 solution is shown in fig. 2 of the Enclosure. Orig. art. has: 3 figures, 5 tables.

ASSOCIATION: Institut elektrosvarki im. Ye. O. Patona, AN UkrSSR, Kiev (Institute of Electric Welding, AN UkrSSR); Fiziko-mekhanicheskiy institut, AN UkrSSR, L'vov (Physico-Mechanical Institute, AN UkrSSR)

14,55

SUBMITTED: 24Mar65 ENCL: 02 SUB CODE: MM

NO REF SOV: 004 OTHER: 000

Card 2/4

L 1439-66

ACCESSION NR: AP5022405

ENCLOSURE: 01

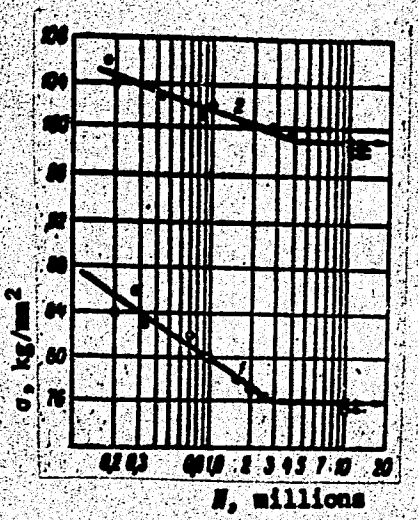

Fig. 1. 1--initial ShKh15 steel; 2--electron beam smelted ShKh15 steel.

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L 1439-66

ACCESSION NR: AP5022405

ENCLOSURE: 02

Fig. 2. 1--annealed steel; 2--tempered steel; I, 1--untreated steel; II, 2--electron beam smelted steel.

Card 4/4

L 8223-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG/JT

ACC NR: AP5026532 SOURCE CODE: UR/0286/65/000/019/0072/0072

INVENTOR: Movchan, B. A.; Statkevich, V. N.

TITLE: Molybdenum-base alloy. Class 40, No. 175235 [announced by the Electric Welding Institute im. Ye. O. Paton, AN UkrSSR (Institut elektrosvarki AN UkrSSR)]

SOURCE: Byulleten' izobreteniy i tovarnykh znakov, no. 19, 1965, 72

TOPIC TAGS: molybdenum, molybdenum alloy, titanium containing alloy, carbon containing alloy

ABSTRACT: This Author Certificate introduces a molybdenum-base alloy containing 0.05—0.1% Ti, 0.08—0.12% C, and the balance molybdenum. [ND]

SUB CODE: 11/ SUBM DATE: 21Jul64/ ATD PRESS: 4148

Card 1/1 UDC: 669.28.018.2

L 20630-66 EWT(m)/EWA(d)/T/EWP(t) IJP(c) JD/DJ

ACC NR: AP6010134 SOURCE CODE: UR/0133/66/000/003/0230/0232

AUTHOR: Yefimenko, Yu. M.; Movchan, B. A.; Tikhonovskiy, A. L.

ORG: Electric Welding Institute im. Ye. O. Patona, AN UkrSSR (Institut elektrosvarki AN UkrSSR)

TITLE: Electron-beam melting and purification of ShKh15 ball-bearing steel

SOURCE: Stal', no. 3, 1966, 230-323

TOPIC TAGS: ball bearing steel, steel purification, steel melting, electron beam melting /

ABSTRACT: Arc-melted ShKh15 ball-bearing steel was remelted in L-2 or U-143 electron-beam furnaces into 25—30 kg ingots with a diameter of 100 mm. The macrostructure of the ingots was dense and uniform; the shrinkage cavity extended to a depth of 0.2—0.3 diameter. Single or double remelting did not affect the carbon, silicon, and phosphorus contents but lowered the manganese, chromium, sulfur, oxygen, nitrogen, and hydrogen contents. After single remelting, manganese was reduced from 0.28 to 0.03—0.04%, chromium from 1.50 to 1.40—1.41%, sulfur from 0.015 to 0.006—0.008%, oxygen from 0.0040 to 0.0007—0.0010% nitrogen from 0.0070 to 0.0011—0.0013%, and hydrogen from 0.00010

Card 1/2 UDC: 669.187.26:621.365.91

L 21600-66
ACC NR: AP6010134

to 0.00001—0.00004%. Double remelting had no significant effect, except for the case of sulfur, whose content dropped to 0.004. Electron-beam melting increased the steel density from 7.811 to 7.822 g/cm^3 and reduced considerably the content of harmful inclusions. No carbide segregation was observed. The content of nonmetallic inclusions met the most rigid specifications. The oxides and silicate inclusions completely disappeared. The steel hardenability was not affected by electron-beam melting in spite of the almost complete removal of manganese. Orig. art. has: 4 figures. [WW]

SUB CODE: 11/ SUBM DATE: none/ ORIG REF: 003/ ATD PRESS: 4225

Card 2/2 BK

L 22995-66 EWI(m)/EWP(w)/EPF(n)-2/T/EWP(t) JD/WW/JG/GS

ACC NR: AT6008645 SOURCE CODE: UR/0000/65/000/000/0018/0027

AUTHORS: Malashenko, I. S. (Kiev); Movchan, B. A. (Kiev)

ORG: none

TITLE: Investigations of the influence of complex alloying on the physico-mechanical properties of niobium

SOURCE: Vsesoyuznoye soveshchaniye po voprosam staticheskoy i dinamicheskoy prochnosti materialov i konstruktsionnykh elementov pri vysokikh i nizkikh temperaturakh, 3d. Termoprochnost' materialov i konstruktsionnykh elementov (Thermal strength of materials and construction elements); materialy soveshchaniya. Kiev, Naukova dumka, 1965, 18-27

TOPIC TAGS: niobium, niobium alloy, molybdenum, tungsten, zirconium, chromium, vanadium, metallurgic testing machine/ 2SN1 niobium alloy, 4SN3 niobium alloy, IM-4R metallurgic testing machine

ABSTRACT: The effect of alloying niobium with transition elements Mo, W, Zr, and V on its physical and mechanical properties was investigated. The alloys were prepared after the method developed by the Institute for Electrowelding im. Ye. O. Paton AN UkrSSR (Institut elektrosvarki im. Ye. O. Paton AN UkrSSR). Microphotographs of the alloys studied are presented. The microhardness, strength limit, degree of deformation during cold setting, and the change in the lattice parameter of the alloy were determined as a function of the alloy composition. The experimental results are

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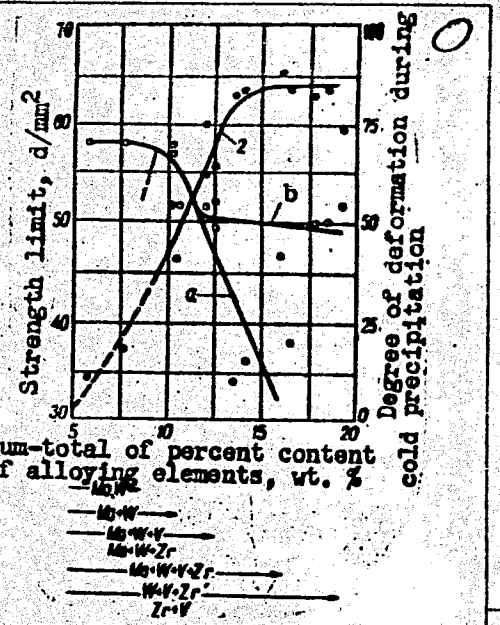
L 22995-66

ACC NR: AT6008645

presented in graphs and tables (see Fig. 1).

Fig. 1. Change of strength limit (2) and workability (1) of niobium as a function of the alloying elements content.



It was found that complex alloying of niobium increases the strength properties of the latter, the increase being proportional to the complexity of the alloy composition. Tungsten affects the plasticity of niobium to a lesser degree than molybdenum. The change in the lattice parameter for niobium alloys containing Mo, W, and V was found to be very nearly linear. Orig. art. has: 2 tables and 6 graphs.

Card 2/2 SUB CODE: 11/ SUBM DATE: 19Aug65/ ORIG REF: 003/ OTH REF: 010

L 23001-66 EWP(e)/EWT(m)/EWP(w)/T/EWP(t) IJP(c) JD/JG/JT

ACC NR: AP6012145 SOURCE CODE: UR/0413/66/000/007/0061/0061

47
B

INVENTOR: Movchan, B. A.; Statkevich, V. N.

ORG: none

TITLE: Molybdenum-base alloy. Class 40, No. 180352 [announced by the Electric Welding Institute im. Ye. O. Paton, AN UkrSSR (Institut elektrosvarki AN UkrSSR)]

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 7, 1966, 61

TOPIC TAGS: molybdenum, molybdenum alloy, titanium containing alloy, boron containing alloy

27 27 29

ABSTRACT: This Author Certificate introduces a molybdenum-base alloy with improved physicomechanical and technological properties containing 0.05—0.1% titanium and 0.15—0.3% boron. [AZ]

18

SUB CODE: 11/ SUBM DATE: 16May64/ ATD PRESS: 4238

2

Card 1/1 dlw UDC: 669.28'781'295

L 07843-67 EWT(m)/EWP(t)/ETI/EWP(k) IJP(c) JD/JG/GD
ACC NR: AT6034441 (A,N) SOURCE CODE: UR/0000/66/000/000/0099/0104

AUTHOR: Movchan, B. A.; Malashenko, I. S.

ORG: none

TITLE: The strength and ductility of some single-phase and two-phase electron beam-melted niobium-base alloys

SOURCE: AN SSSR. Institut metallurgii. Svoystva i primeneniye zharoprochnykh splavov (Properties and application of heat resistant alloys). Moscow, Izd-vo Nauka, 1966, 99-104

TOPIC TAGS: niobium base alloy, carbon containing alloy, tungsten containing alloy, zirconium containing alloy, alloy microstructure, alloy mechanical property

ABSTRACT: The microstructure and mechanical properties have been investigated in electron beam-melted binary Nb-0.1% C and Nb-0.15%C alloys, in ternary Nb-16.5% W-0.1% C and Nb-16.5% W-0.15% C alloys, and in a quaternary Nb-16.5% W-0.1% C-0.5% Zr alloy. Carbon in an amount of 0.15% increased the susceptibility to brittle failure of niobium and Nb-W solid solution at room temperature. Generally, the addition of more than 0.1% C led to a complete loss of ductility of all tested alloys. However, at temperatures higher than 0.45 of the melting tem-

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L 07843-67

ACC NR: AT6034441

perature, the addition of 0.1% carbon effectively strengthened the alloy matrix. Alloying Nb-16.5% W-0.1% C alloy with 0.5% Zr increased the strength and ductility characteristics of cast metal, e.g., the tensile strength from 51.3 to 59 kg/mm^2 and elongation from 4.8 to 10%. Zirconium addition also reduced the anisotropy of the mechanical properties of cast Nb-W-C alloys. After hot deformation and annealing Nb-C alloys at 1150C for 2 hr and Nb-W-C alloys at 1400C for 2 hr, the alloys had a recrystallized structure with a respective grain size of 5—6 and 7—8 (on the standard scale) and with uniformly distributed globular carbide particles. Recrystallized Nb-16.5% W-0.1% C-0.5% Zr alloy had a room-temperature tensile strength of 70 kg/mm^2, an elongation of 27.8%, a reduction of area of 55.6% and a tensile strength of 35.0 kg/mm^2 at 1200C. Thus, complex alloying of niobium with elements of the IVa and VIa groups within the limits of solid solutions makes it possible to obtain high-strength compositions with a satisfactory ductility at room temperature. Orig. art. has: 4 figures and 2 tables.

SUB CODE: 11/ SUBM DATE: 10Jun66/ ORIG REF: 008/ OTH REF: 009/
ATD PRESS: 5102

Card 2/2 bc

ACC NR: AP7002311 SOURCE CODE: UR/0126/66/021/003/0448/0451

AUTHOR: Movchan, B. A.; Nerodenko, L. M.

ORG: Institute of Electric Welding im. Ye. O. Paton, AN UkrSSR (Institut elektrosvarki AN UkrSSR)

TITLE: Equality of activation energies for delayed fracture, steady-state creep and climb of dislocations in high-alloy steels

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 3, 1966, 448-451

TOPIC TAGS: crystal dislocation, creep, high alloy steel, material fracture

ABSTRACT: The authors studies the interrelationship between polygonization parameters in cast high-alloy steels for strength and creep properties at temperatures 5% above the melting point under relatively high stresses. Equality is established between the activiation energies for polygonization, delayed fracture and steady-state creep. The resultant data are treated from the standpoint of the mechanism of thermally activated dislocation climb as determined from the rate at which the processes studied take place. The alloys studied were Kh17N17 (0.05-0.07% C, 0.6-0.7% Si, 16.5-18% Cr, 16.5-17.5% Ni, remainder--iron) and Kh15N37 (0.05-0.07% C, 0.6-0.7% Si, 37.0-38.0% Ni, 15.0-16% Cr, remainder--iron) additionally alloyed with manganese, tungsten and molybdenum. The alloying elements were added in identical

Card 1/2 UDC: 548.0:539

0925 0585

ACC NR: AP7002311

quantities (1.7 and 3.4 at.%) during melting to study the effect of these elements on the mobility of defects in an iron-chromium-nickel solid solution. Cast specimens of standard size were used for mechanical tests of delayed fracture. The tests for Kh17N17 alloys were conducted at T=600° with σ=25 kg/mm^2, while tests of Kh15N37 alloys were conducted at T=650° with σ=25 kg/mm^2. Orig. art. has: 5 figures, 1 formula and 1 table. [JPRS: 37,415]

SUB CODE: 11, 20 / SUBM DATE: 27Mar65 / ORIG REF: 002 / OTH REF: 001

Card 2/2

MOVCHAN, B.N.

Polarimetric study of the nebula NGC 6523 and the open cluster NGC 6530. Uch.zap. LGU no.326 [illegible] '64.

(MIRA 18:5)

L 31001-66 EWT(1)/FCC GW

ACC NR: AT6007609 SOURCE CODE: UR/2960/65/000/003/0048/0054

AUTHOR: Rodionov, S. F.; Movchan, B. N.

ORG: none

TITLE: Application of the theory of multiple light scattering in the atmosphere to the effect of anomalous transparency

SOURCE: Leningrad. Universitet. Problemy fiziki atmosfery, no. 3, 1965, 48-54

TOPIC TAGS: anomalous transparency, direct solar light, ultraviolet spectral range, aerosol, spectral transparency, light scattering

ABSTRACT: The effect of anomalous transparency consists of an increase in the relative atmospheric transparency for light of shorter wavelengths when the sun nears the horizon. This effect can be detected by observations of direct solar light in the ultraviolet spectral range of the ozone zone at 2950—3260 Å. Several theories have been offered in explanation of this phenomenon. S. F. Rodionov (S. F. Rodionov. Prozrachnost' atmosfery v ul'trafioletovoy oblasti spektra. Izv. AN SSSR, Seriya geogr. i geofiz., t. 14, No. 4, 1950; S. F. Rodionov, Ye. N. Pavlova, Ye. V. Rdultovskaya, N. M. Reynov. Selektivnaya prozrachnost' atmosfernykh aerozoley. Izv. AN SSSR, Seriya geogr. i geofiz., No. 4, 1942.) explained anomalous transparency as resulting from specific atmospheric layers consisting of aerosols and appearing near the earth's surface in the morning and evening. Spectral investigations of atmospheric transparency showed

Card 1/2

similarity to the spectral transparency of aerosols at the wavelengths 3125 Å and 3250 Å. The daily rate of the aerosol absorption bands with an increase of transparency at noon and a decrease at evening correlated with the daily rate of humidity changes. This could be considered as support of Rodionov's theory. G. V. Rozenberg (O granitsakh primenimosti zakona Bugera i ob effektakh obrashcheniya, anomal'noy prozrachnosti i selektivnoy prozrachnosti atmosfery. DAN SSSR, t. 145, No. 6, 1962.) and G. P. Gushchin (K teorii effekta anomal'noy prozrachnosti. Izv. AN SSSR, seriya geofiz., No. 8, 1962.) hypothesized the anomalous transparency as a result of multiple light scattering in the atmosphere at a low position of the sun. An attempt was made to support this hypothesis by observations at sea level, but the results of the observations were criticized. In 1962, photometric measurements in the spectral ultraviolet ozone zone were carried out at a height of 4250 m above sea level. The goal of these measurements was to examine the possibility of applying light scattering to anomalous transparency. The distribution of brightness above the solar disk and the aureole near the disk were measured at sunrise and sunset, and the results of the measurements were represented graphically in the original article. No increase of brightness in the solar aureole was found for various zenithal distances of the sun at the moment of development of anomalous transparency. Light scattering cannot be considered to be the reason for anomalous transparency. Orig. art. has: 5 figures.

[EG]

SUB CODE: 04/ SUBM DATE: 07Feb64/ ORIG REF: 010/ ATD PRESS: 4214

L 17408-66 EWT(1)/EWT(m)/FCC/EWP(t) LIP(c) JD/GW
ACC NR: AT6007610 SOURCE CODE: UR/2960/65/000/003/0055/0060

AUTHOR: Rodionov, S. F.; Movchan, B. N. 41 B+1

ORG: Leningrad University (Leningradskiy universitet)

TITLE: Regular twilight variations of atmospheric transparency in the ultraviolet ozone spectral region 27

SOURCE: Leningrad. Universitet. Problemy fiziki atmosfery, no. 3, 1965, 55-60

TOPIC TAGS: atmospheric optics, twilight, atmospheric transparency, ozone spectral region, ozone layer electrophotometry

ABSTRACT: Investigations have been conducted by the Photometry Laboratory of Leningrad State University of regular variations of the terrestrial atmospheric transparency in the ultraviolet ozone region of the spectrum (2950—3300 Å). In addition to changes of transparency attributable to daily ozone fluctuations, the effect of anomalous transparency, and solar eclipses, regular variations in the ultraviolet region have now been found to result from the twilight effect. These twilight variations of transparency in the ultraviolet were detected as a result of a series of photoelectric observations made of the intensity of radiation from the moon and of scattered skylight in the circumlunar region at sunrise. On the basis of analysis of all regular variations of terrestrial atmospheric transparency in the ultraviolet region, it is concluded that: 1) two different types of varia-

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tion exist — those arising as a result of the disruption of the photochemical equilibrium of the ozone layer and those arising as a result of the selective transparency of other components of the atmosphere; 2) the occurrence and development of regular variations is determined by both periodic geophysical and periodic extraterrestrial factors (e.g., solar eclipses, variations in length of the day, etc.). Orig. art. has: 1 figure. [DM]

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STERENBOGEN, Yu.A.; MOVCHAN, B.S.

Some causes of low toughness of vertical seams on low-alloy steel. Avtom.svar.6 no.6:11-19 N-D '53. (MLRA 8:4)

1. Institut elektrosvarki im. Ye.O.Patona Akademii nauk URSR.
(Steel--Welding)

MOVCHAN, B. S.; PATON, Boris Ye. ;

"Radical Electron Beam Heaters for Melting of Metals".

Report to be submitted for the first International Conference on Electron and Ion Beam Science and Technology, sponsored by the Electrothermics and Metturgy Division of the Electrochemical Society and The Metallurgical Society of The American Institute of Mechanical Engineers (AIME), 3-7 Mar 64, Toronto, Canada.

1. MOVCHAN, F. F., - Eng.

2. USSR (600)

4. Floors

7. Machines for polishing parquet floors. Biul. stroi. tekh. 9, no. 20, 1952.

9. Monthly List of Russian Accessions, Library of Congress, January, 1953. Unclassified.

BELIKOV, N.A.; MOVCHAN, F.F.; KRYUGER, Yu.V., redaktor; CHEBYSHEVA, Ye.A. tekhnicheskiy redaktor.

[Use of machinery in painting] Mekhanizatsiia maliarnykh rabot. Moskva, Gos.izd-vo lit-ry po stroitel'stvu i arkhitekture, 1953. 151 p. [Microfilm]
(Painting, Industrial)

MOVCHAN, F.F., inzhener, redaktor; BEGAK, B.A., redaktor; MEDVEDEV, L.Ya., tekhnicheskiy redaktor.

[New methods for the interior finishing in high-storied buildings] Novye metody vnutrennikh otdelochnykh rabot v mnogoetazhnom stroitel'stve. Moskva, Gos. izd-vo lit-ry po stroit. i architekture, 1955. 78 p. (MIRA 8:4)

1. Moscow. Vsesoyuznyy nauchno-issledovatel'skiy institut organizatsii i mekhanizatsii stroitel'stva.
(Building)