BUYNOV, N.N.; ZAKHAROVA, R.R.

Nature of etch figures on aluminum-copper alloys (4 percent copper). Fiz. met. i metalloved. 6 no.2:289-292 '58. (MIRA 11:9)

1. Institut fiziki metallov Ural'skogo filiala AN SSSR.
(Aluminum-copper alloys--Metallography) (Metals--Etching)

SOV/126-6-4-17/34

AUTHOR: Rakin, V.G.,
Buynov, N.N.

TITLE: On the Nature of Etch-Figures in the Al-Cu Alloys
(O prirode figur travleniya v splavakh Al-Cu)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6,
Nr 4, pp 686-691 (USSR)

ABSTRACT: The object of the present investigation was to establish the extent to which the structural changes occurring during decomposition of solid solutions are reflected in the nature of the etch-figures and to study the effect of mosaic structure on the age-hardening processes. The experimental Al-Cu alloys, prepared from high purity materials subjected to a preliminary vacuum treatment, contained 0.25, 0.5, 1.5, 4.0% Cu. The experimental specimens, both solution-treated and aged at 150, 190 or 250°C, were etched with "aqua regia", the Lacombe reagent (Ref.10) or the Tucker reagent (Ref.11), all of which produce cubic etch-figures on pure aluminium. The chemically or, in some cases, electrolytically etched surfaces were examined with the aid of an electron microscope, hardness measurements being used

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On the Nature of Etch-Figures in the Al-Cu Alloys

to check the progress of the ageing treatment. The alloys containing up to 0.5% Cu which do not age-harden, were characterised by etch-figures, cubical in shape (Fig.1-3). On the other hand, both cubic and octahedral or rhombo-dodekahedral etch-figures were observed on the 1.5% Cu alloy (Fig.4-7): The two latter forms were associated with the initial stages of age-hardening, but the octahedral etch-figures appeared also on alloys in which the second phase had been precipitated in the form of comparatively large particles. The electron microscope replicas of this alloy aged for 24 hrs. at 150°C showed white spots indicating the presence of the Hinde-Preston zones (Fig.6). In the case of the 4.0% Cu alloy aged at 250°C, the etch-figures lost their regular shape and decreased in size with increasing time of the ageing treatment, although large, octahedral etch-figures were formed on an over-aged alloy of this composition, characterised by large particles of the precipitated $\Theta'$ phase. On one occasion, a spiral etch-figure was observed on an electrolytically etched

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On the Nature of Etch-Figures in the Al-Cu Alloys

specimen of this alloy. As regarding the white spots observed on some of the electron microscope replicas and corresponding to the Hinde-Preston zones, three distribution patterns were distinguished: (i) Spots randomly distributed (ii) spots forming a honeycomb pattern and (iii) spots forming a regular network or parallel chains. It is postulated that in the case (i) the white spots are either not associated with dislocations or correspond to dislocations distributed in a manner corresponding to the Taylor lattice. The honeycomb pattern is associated with the presence of very fine, sub-microscopic mosaic (0.1 - 0.2 μ) whose boundaries are formed by dislocations. The third pattern corresponds to dislocations forming the boundaries of subgrains, the size of which may vary from 0.3 - 0.5μ to several microns, depending on the degree of decomposition of the solid solution. The analysis of the experimental results led the present authors to the following conclusions: The etch-figures in the Al-Cu alloys are associated with the presence of large, screw or helicoidal dislocations. (It is not

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On the Nature of Etch-Figures in the Al-Cu Alloys SOV/126-6-4-17/34

possible to determine the magnitude of the Burgers vector or the pitch of the screw, owing to the small height of the spiral step.) The shape of the etch-figures depends not only on the degree of decomposition of the solid solution but also on the copper content and the age-hardening characteristics of the alloy. The etch-figures are closely associated with subgrains or mosaic blocks of the alloy and the dislocations are distributed along the sub-boundaries, forming characteristic, network-like pattern. There are 8 figures and 13 references of which 8 are Soviet and 5 English.

ASSOCIATION: Institut Fiziki Metallov Ural'skogo Filiala AN SSSR (Institute of Metal Physics, Ural Branch, Ac.Sc.USSR)

SUBMITTED: 9th May 1957.

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18.7500

69711
SOV/81-59-9-30460

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 9, p 58 (USSR)

AUTHOR: Buynov, N.N.

TITLE: An Investigation of Decomposition in Oversaturated Solid Metal Solutions 18

PERIODICAL: Tr. In-ta fiz. metallov. Ural'skiy fil. AS USSR, 1958, Nr 20, pp 283-301

ABSTRACT: Based on the investigations carried out and literature data the author comes to the conclusions that in most alloys of the aging type decomposition starts with the formation of Guinniet (Gin'ye)-Preston zones of equiaxial form or similar to it and not with the formation of zones which are 1 - 3 atomic layers thick, as was assumed earlier. Decomposition takes place in the following steps: Guinniet-Preston zones → particles of metastable phases → particles of stable phases by reorganization of the atoms, but not by nucleation, and is accompanied by the processes of coalugation and dissolution. The principal peculiarity is the process of the enriching of the zones and then also the particles of the metastable phases with alloying components. A comparison between the crystallization

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An Investigation of Decomposition in Oversaturated Solid Metal Solutions

in the solid and liquid phases has been carried out. The mechanism and the kinetics of the formation of a new phase, the structure and the structural changes in the matrix of the solid solution which take place during decomposition, the structure of alloys of high stability, and the factors determining the value of the coercive force of the alloys, have been considered.

From the author's summary

Card 2/2

AUTHORS: Rakin, V. G., Buynov, N. N. SOV/20-121-2-21/53

TITLE: Experimental Observation of Dislocation Sources by Means of Separated Matter (Eksperimental'noye nablyudeniye istochnikov dislokatsiy s pomoshch'yu vydeleniy )

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 121, Nr 2, pp. 271 - 273 (USSR)

ABSTRACT: The possibilities of detecting and visualizing dislocation sources by means of electron-microscopic photographs of alloys are investigated. Such investigations and attempts to give a theoretical explanation of the phenomena were already carried out by Frank and Read (Rid)(Ref 1) and by Kuhlmann-Wilsdorf (Kul'mann-Vil'sdorf)(Refs 2,3,5). The former ascertained almost round closed loops or meshes, the latter groups of little chains ( in Al-Cu-alloys). In the present paper a report is presented on investigations of Al-Cu-alloys(4% Cu). Part of the samples was aged for 4 hours at 190°C and another part for 30 minutes at 250°C; in electron-microscopic photographs separate chains consisting of almost closed, closely adjoining or also torn meshes or links, respectively,were detected (Figs 1-3). Out of 43

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investigated photographs of sources the inclination of the levels in which the sources were located in 8 cases was approximately {111}, in 10 cases {112}, in 6 cases {122}, in 7 cases {123}, in 2 cases {110}, and in 2 other cases {110}. The authors ascertained that these meshes nearly always had "centers" (see Figs 1 and 2), which had an open hexagonal or round shape. It was found that the distance between the meshes increases with the distance from the center. The results of 17 measurements of distances are given: If the first mesh is 0,47μ removed from the center, between the first and second mesh there is a distance of 0,55μ, 0,72μ between the third and fourth; at greater distances 1,75μ were measured. Such centers can have two dislocations of inverse sign. The authors express their gratitude to A.N. Orlov for having taken interest in their work. There are 4 figures and 5 references, 0 of which is Soviet.

Experimental Observation of Dislocation Sources by Means of Separated Matter SOV/20-121-2-21/53

ASSOCIATION: Institut fizikii metallov Ural'skogo filiala Akademii nauk SSSR (Institute of Metal Physics, Ural Branch, AS USSR)

PRESENTED: January 15, 1958, by G.V.Kurdyumov, Member, Academy of Sciences, USSR

SUBMITTED: January 8, 1958

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B-4-Nov, A.N.

18(7) PHASE I BOOK EXPLOITATION SOV/3355

Akademiya nauk SSSR. Institut metallurgii. Nauchnyy sovet po probleme zharoprochnykh splavov

Issledovaniya po zharoprochnym splavam, t. IV (Studies on Heat-resistant Alloys, vol. 4), Moscow, Izd-vo AN SSSR, 1959. 400 p. Errata slip inserted. 2,200 copies printed.

Ed. of Publishing House: V. A. Klimov; Tech. Ed.: A. P. Guseva; Editorial Board: I. P. Bardin, Academician; G. V. Kurdyumov, Academician; N. V. Ageyev; Corresponding Member, USSR Academy of Sciences; I. A. Oding, I. M. Pavlov, and I. F. Zudin, Candidate of Technical Sciences.

PURPOSE: This book is intended for metallurgists concerned with the structural metallurgy of alloys.

COVERAGE: This is a collection of specialized studies of various problems in the structural metallurgy of heat-resistant alloys. Some are concerned with theoretical principles, some with descriptions of new equipment and methods, others with properties of specific materials. Various phenomena occurring under specified conditions are studied and reported on. For details, see Table of Contents. The articles are accompanied by a number of references, both Soviet and non-Soviet.

Studies (Cont.) SOV/3355



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SOV/126-7-4-25/26

AUTHORS: Buynov, N.N. and Rakin, V.G.

TITLE: On the Nature of the Horizontal Portion of the Isothermal Hardness Curves of the Al-Cu Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 4, pp 638-639 (USSR)

ABSTRACT: The authors discuss an effect observed in the course of an electron microscope study of the slip lines on the surface of the 4% Cu-Al alloy deformed in tension after having been aged for various periods at 90°C (Ref 1). It was found that in specimens aged for 30 minutes to 4 hours (which corresponded to the horizontal portion of the hardness versus ageing time curve), the average distance between the slip lines and particularly the average height of the slip steps did not depend on the ageing time, although such dependence was observed in specimens aged for shorter or longer periods. At the same time, the maximum height of the slip steps in specimens aged for 30 minutes to 4 hours increased slightly with the ageing time and decreased rapidly on further ageing, this effect being accompanied by a decrease in the number of Hinde-Preston effects on the

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SOV/126-7-4-25/26

On the Nature of the Horizontal Portion of the Isothermal Hardness Curv
Curves of the Al-Cu Alloy

electron microscope photographs. The results of these observations are given in a table on p 639 under the following headings: ageing time; hardening stage (beginning of the increase of hardness; beginning of the horizontal portion on the ageing curve; end of the horizontal portion of the curve; maximum hardness); average distance between the slip lines, μ; height of the slip steps, Å, (average and maximum); yield point, $kg/mm^2$. The effects described above, which were also observed in the 4% Cu-Al alloy aged at 150°C for sufficiently long periods, indicate that a partial recovery takes place during the hardening stage corresponding to the horizontal portion on the ageing curve; this is also indicated by the fact that the yield point of specimens aged for 30 minutes to 4 hours remain constant. This isothermal recovery cannot be, as in the case of normal recovery (Ref 3 and 4), attributed to the existence of the Hinde-Preston zones of a critical size or to the 2-stage character of the decomposition process. It appears that isothermal

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recovery is associated with the redistribution and partial recovery of the internal stresses present in the alloy, as a result of which conditions favourable for the solution of the Hinde-Preston zones, and particularly of the θ' phase, are established in some domains of the alloy, while in the other domains both the Hinde-Preston zones and the particles of the θ' phase become more stable. It is probable that normal recovery is also associated with the redistribution and partial relief of stresses (induced at low ageing temperatures) at the temperature of recovery. These processes lead, in turn, to a partial dissolution of the Hinde-Preston zones which was proved experimentally on single crystals of the Al-Cu alloy (Ref 5) and on polycrystalline specimens of the Al-Ag alloy (Ref 6). The postulated mechanism of recovery is confirmed, also, by partial dissolution of the Hinde-Preston zones and particularly of the θ' phase in the Al-Cu alloy during

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On the Nature of the Horizontal Portion of the Isothermal Hardness Curves of the Al-Cu Alloy

deformation (Ref 8). There is 1 table and 6 Soviet references.

ASSOCIATION: IFM AN SSSR (Institute of Metal Physics, AS USSR)

SUBMITTED: July 2, 1958

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SOV/126-7-6-23/24

AUTHORS: Rakin, V.G. and Buynov, N.N.

TITLE: Electron Microscope Study of Slip Lines in an Aluminium-Copper Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 6, pp 939-943 (USSR)

ABSTRACT: The investigation was carried out on electrolytically polished and etched polycrystalline specimens of an aluminium alloy containing 4% Cu, which were pulled to fracture. Oxide prints were obtained of the place of fracture, as well as of the side surface close to the fracture (within a distance of 4 mm). Prior to deformation the specimens, which had been quenched from 535°C, were aged at 190 and 250°C. The alloy was tested for hardness in relation to ageing time. For comparison, the structure of the deformed surface of pure aluminium (99.99%) was studied. The direction of slip, its magnitude and the distance between the slip lines in the initial stages of ageing of the alloy were determined from the etch figures, and in the later stages from the precipitates. Besides, the slip lines were also used for the determination of the crystallographic indices of the

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Electron Microscope Study of Slip Lines in an Aluminium-Copper Alloy

surface of the micro-section. The method for such measurements is described in various papers (Refs 1-4). As a result of the treatment of 700 electron exposures, curves were obtained showing the distribution of slip in the slip lines, as well as the distribution of the spacings between the lines (Figs 1 and 2). Graphs were plotted from electron photomicrographs of the side surface of the specimen. Each curve was plotted from 200-650 measurements. In the curves for aluminium and for the Al-Cu alloy aged at 190°C to maximum hardness, there is one maximum and in the other curves there are two maxima. From a consideration of the curves in the two figures, the authors conclude that micro-slip may be due to the following:

1. Dislocations which form readily in the vicinity of heterogeneous inclusions as a result of stress concentrations around them (Ref 6).
2. Dislocation sources arising from packing defects due to vacancy condensation (Ref 7).
3. Dislocations forming spontaneously in the material on

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Electron Microscope Study of Slip Lines in an Aluminium-Copper Alloy

applying a stress in excess of the U.T.S. (Ref 8). It is difficult to say which of these factors is actually responsible for micro-slip. The origin of slip lines with great slip in one atomic plane is the result of screw dislocations. According to Suzuki (Ref 5), coarse lines with slip in a packet of atomic planes form as the result of the action of terminal members of the dislocation network. This interpretation, however, cannot be taken as a final one, as the formation of new dislocations by the Frank-Reid mechanism can be disputed (Ref 10), and besides, other possible mechanism for multiplication of dislocations exist (Refs 8 and 11). The authors conclude that the final answer to the question regarding the origin of fine and coarse slip lines can be given only after the real mechanism of the formation of new dislocations and the nature of its action under conditions of plastic deformation have been clarified. There are 2 figures and 13 references, 1 of which is Soviet, 2 German and 10 English.

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ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics, Ac.Sc., USSR)

SUBMITTED: July 2, 1958

66227

SOV/126-8-3-10/33

18.1210

AUTHORS: Buynov, N.N., Shchegoleva, T.V., Rakin, V.G., Komarova, M.F. and Zakharova, R.R.

TITLE: Electron Microscopic Investigation of Etch Figures in Age Hardening Aluminium Alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 3, pp 387-393 (USSR)

ABSTRACT: The results of an electron microscopic investigation of dimensions, form and structure of etch figures in age hardening aluminium alloys are discussed. In the table on p 388, data of the dimensions and shape of the etch figures for various alloys are given. The dimensions of the figures change within very wide limits from several microns to a few tenths. It is characteristic that for the majority of quenched, slightly aged specimens the etch figures are straight-sided (Fig 1) and for the hardened alloys they have an oval shape (Fig 2). Their dimensions decrease in relation to time and artificial ageing, when the hardness of the alloys increases. In Fig 3, an electron micrograph of an Al-Zn-Cu (10% Zn and 0.5% Cu) alloy, deformed by compression by 15% and aged at 180°C for 6 hours, is shown.

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66227

SOV/126-8-3-10/33

Electron Microscopic Investigation of Etch Figures in Age Hardening Aluminium Alloys

Spiral steps can be seen. Fig 4 is an electron micrograph of an Al-Cu (4% Cu) alloy aged at 220°C for 5 min. Craters can be seen at the top of octahedra, suggesting screw dislocations. Fig 5 shows scheme for the layout of primary mosaic blocks in the crystalline alloy, the possible axes along which new blocks can form are shown by arrows. The authors arrive at the following conclusions: (1) The shape and dimensions of etch figures in aluminium alloys change with the time and temperature of ageing. (2) The relationship between etch figures and large screw or spiral dislocations justifies the assumption that they correspond to mosaic blocks. There are 5 figures, 1 table and 17 references, 7 of which are Soviet, 1 German, 1 Dutch and 8 English.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Metal Physics AS USSR)

SUBMITTED: August 12, 1958

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SOV/126-8-3-21/33

AUTHORS: Buynov, N.N. and Shchegoleva, T.V.

TITLE: A Few Characteristics of the Distribution of Etch Figures in an Al-Zn-Cu Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 3, pp 455-457 (USSR)

ABSTRACT: On studying the electrolytically polished and chemically etched (aqua regia) surface of an Al-Zn-Cu alloy (10% Zn, 0.5% Cu) which had been deformed in compression by less than 1%, spirals were observed which may possibly illustrate either Frank and Read's mechanism (Ref 1) or the existence of screw or helical dislocations. Beside them loops were observed, which were similar in shape to dislocation loops emitted by Frank and Read sources. They were observed not only within the grains (Fig 1 and 2) but also in grain boundaries (Fig 3). In the first case they are met with more frequently in groups, each of which contain from 2 to 7 loops. In those cases where the loops are not continuous, they have the shape of hooks, the ends of which are bent inwards (Fig 1 to 6), which points to their non-accidental origin. Light photographs in a

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SOV/126-8-3-21/33

A Few Characteristics of the Distribution of Etch Figures in an Al-Zn-Cu Alloy

dark background (Fig 3) show that the loops consist of etched figures. However, there is one characteristic in the distribution of the loops which makes it doubtful as to whether they were formed due to the work of Frank and Read sources. In the central portion of several loop groups, a few small hooks with different orientation are observed in each group (in Fig 1 shown by an arrow). This peculiarity is difficult to understand if one takes Frank and Read's dislocation propagation as a basis and the authors of this paper have come to the conclusion that these loops are due to local stresses in various portions of the alloy. Gratitude is expressed to A.N. Orlov for discussion of the results of this paper. There are 6 figures and 4 references, 2 of which are Soviet and 2 English.

ASSOCIATION: Institut fiziki metallov AN SSR (Institute of Metal Physics AS USSR)

SUBMITTED: August 12, 1958

Card 2/2

18.9000

67691

SOV/126-8-4-13/22

AUTHOR: Buynov, N.N.

TITLE: Electron Microscopic Study of the Guinier-Preston Zone Distribution in Ageing Alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 4, pp 584-589 (USSR)

ABSTRACT: In this article only the results of a study of the distribution of these zones are given. In the second column of the Table (pp 584 and 585) the dimensions of the "net" are given which the G.P. zones form in various alloys. The net consists of equi-axed and sometimes also elongated cells (Figs 1a, 1б). All figures are electron photomicrographs. Fig 1a - Al-Cu (4% Cu) alloy after natural ageing; б - Al-Ag (10% Ag) alloy after natural ageing; в - Al-Cu (4% Cu) alloy aged at 180 °C for 30 minutes. Fig 2 shows an alloy consisting of 6.3% Cu, 0.7% Mn, 0.14% Ti, remainder aluminium, after annealing at 250 °C for 10 hours and creep testing at 350 °C for 100 hours at a load of 3 kg/mm$^2$. Fig 3 shows an Al-4%Cu alloy which has been electrolytically polished, deformed (1-9% by pulling) and aged at 150 °C for 1 hour. Fig 4 shows an Al-Zn-Cu alloy

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Electron Microscopic Study of the Guinier-Preston Zone Distribution in Ageing Alloys

(10% Zn and 4% Cu) aged at 150 °C for 1 hour. Fig 5 is an Al-1.2%Si alloy etched, quenched from 525 °C and aged at 255 °C for 8 mins. Fig 6 is a naturally aged Al-1%Cu alloy. Fig 7 is an Al-4%Cu alloy aged at 340 °C for 1 hour, followed by compressional deformation by a reduction in area of 90%. The author arrives at the following conclusions. 1) From the distribution of G.P. zones and the alloy component in alloys space lattices have been found to exist with a unit cell dimension of the order of 0.1 μ. 2) It has been found that the dimensions of the unit cells of the lattice are unaffected by heat treatment and deformation. 3) The results obtained by experiment and quoted in literature lead to the conclusion that the lattices observed correspond to submicromosaic blocks. 4) It is suggested that the submicromosaics play a part in the hardening of alloys.

There are 7 figures, 1 table and 21 references, of which 11 are Soviet, 3 French, 5 English, 1 is German and 1 is European.

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Electron Microscopic Study of the Guinier-Preston Zone Distribution in Ageing Alloys

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, Ac.Sc. USSR)

SUBMITTED: January 16, 1959

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67758

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18.1210

SOV/126-8-5-10/29

AUTHORS: Zakharova, R.R., and Buynov, N.N.

TITLE: A Few Peculiarities in the Structure of Anomalous Effects in Laue Patterns of the Ageing Alloys Al-Ag and Al-Ag-Cu

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, 1959, Nr 5, pp 705-708 (USSR)

ABSTRACT: Anomalous effects in the form of diffuse spots and haloes are observed in Laue patterns obtained from coarse-grained quenched specimens of the alloys Al-Ag (20%) and Al-Ag (20%)-Cu (0.1, 1 and 5%). After short artificial ageing their intensity increased and their extent decreased. Lerinman et al (Ref 1) have found that these effects in the opposite field correspond to anomalous scattering regions in the form of full spheres with an "intensity nucleus" at the centre. On the basis of Yelistratov's work (Ref 2) each of these spheres was considered to be the result of superposition of two anomalous scattering regions, also of spherical shape but of different dimensions. One of them is due to equiaxial Guinier-Preston zones, enriched with silver atoms; the other is due to the dimensions and shape of the disturbed regions in the matrix in which the zones

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A Few Peculiarities in the Structure of Anomalous Effects in Laue Patterns of the Ageing Alloys Al-Ag and Al-Ag-Cu

are located ("hole" effect). As the constants of the crystal lattices of the matrix and zones differ from each other only slightly, both types of anomalous scattering regions are superimposed. The holes and G.P. zones scatter the X-rays in antiphase, and hence the total intensity is determined by the difference between the mean scattering powers of the zone atoms and the basic crystal lattice. Due to the difference in dimensions between the anomalous scattering regions of the zones and holes, the resultant intensity distribution in the vicinity of the inverse lattice sites will have the shape of hollow spherical shells with the "intensity nuclei" at their centres. The holes are bigger than the zones because of the transition layer between the zones and the matrix. The anomalous scattering regions, corresponding to holes and associated with the inverse lattice sites of the solid solution, are called (after Yelistratov) regions of the first type, and the anomalous scattering regions corresponding to G.P. zones are called regions of the second type. The following peculiarities in the

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A Few Peculiarities in the Structure of Anomalous Effects in Laue Patterns of the Ageing Alloys Al-Ag and Al-Ag-Cu

structure of the anomalous spots have been established: 1) the intensity of that part of the halo which is directed towards the centre of the crystallogram is greater than that of its opposite part (Fig 1a); 2) in the vicinity of the superimposed Laue spots a sharp decrease in the intensity of the latter is observed on the halo. This gradually merges with the background of the crystallogram. "Supplementary" regions of zero intensity arise (these are shown by double arrows in Figs 1b and 1B). In Fig 2 anomalous spot formation is shown for Al-Ag and Al-Ag-Cu alloys. The intensity distribution in the vicinity of an inverse lattice site is shown in Figs 3a, B and d for the particular case when the zone and matrix constants coincide, and in Figs 3b, г and e for the case when they differ somewhat. A more accurate understanding of the structure of anomalous scattering regions and of the anomalous effects enables (i) the G.P. zone structure to be established (i.e. whether it is close to the matrix or to the precipitated phase); (ii) the width of the transition layer to be

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SOV/126-8-5-10/29

A Few Peculiarities in the Structure of Anomalous Effects in Laue Patterns of the Ageing Alloys Al-Ag and Al-Ag-Cu

determined; and (iii) the G.P. zone composition and the distribution of copper additions in the alloy between the zones and the matrix to be estimated.
There are 3 figures and 8 references, of which 7 are Soviet and 1 is English.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, Academy of Sciences USSR)

Card 4/4

SUBMITTED: February 7, 1959

18.1210
18.9000

67774

SOV/126-8-5-29/29

AUTHORS: Zakharova, R.R., and Buynov, N.N.

TITLE: A Contribution to the Interpretation of Anomalous Effects in the X-ray Crystallograms of Ageing Alloys. II.

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, 1959, Nr 5, pp 798-800 (USSR)

ABSTRACT: Anomalous X-ray scattering effects are reported for the Al-Ag (20%) alloy with 0.6% Mg. Suggested explanations of these effects in crystallograms are shown, in Fig 1a, b, in the present paper and in Fig 2 in Zakharova and Buynov's work (Ref 3), in terms of mutual positions of anomalous scattering regions (O.A.P. in Fig 1a, b) of types I and II. In the selection of Mg as an addition it had been assumed, in view of its considerably larger atomic radius as compared with the atomic radii of Al and Ag, that the form of anomalous effects must change strongly both when magnesium atoms collect in silver-rich zones and when Mg re-distributes itself preferentially in the solid solution. A formation of Mg-base zones was thought to be improbable as the binary Al-Mg alloys after quenching and low-temperature annealing age only slightly. Besides, in the authors'

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A Contribution to the Interpretation of Anomalous Effects in the X-ray Crystallograms of Ageing Alloys. II.

experiments the addition of Mg was negligibly small (below its solubility limit in aluminium at room temperature). In view of the above facts, the following could be expected: (1) If Mg enters silver-rich Guinier-Preston zones in large quantity, then their constant will increase as compared with that of the matrix. Accordingly, anomalous scattering regions of the second type will be "displaced" towards the origin of the coordinates of the inverse lattice matrix. Diffuse spots must appear in X-ray crystallograms in the form of "half-moons" lying with the bulging portion along the trace of the primary beam (Fig 1a). (2) If, however, Mg atoms will mainly enter the solid solution lattice, then anomalous scattering regions of the first type will be "displaced" towards the (000) site. Here the effects will manifest themselves also in the form of "half-moons" in crystallograms, but they will be arranged differently, i.e. with their bent portion towards the primary beam trace (Fig 1b). (3) If the Mg addition is evenly distributed both in the zones and

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A Contribution to the Interpretation of Anomalous Effects in the X-ray Crystallograms of Ageing Alloys. II

in the solid solution, no preferential displacement of any particular region will take place and diffuse spots in the form of rings must be observed (Fig. 1, in Ref. 1). X-ray crystallograms of the Al-Ag alloy with a monatomic addition (Fig. 4, present work) have shown the correctness of the first assumption. Thus the results obtained confirm the correctness of the interpretation of anomalous scattering effects in ageing alloys as form effects.

There are 2 figures and 6 references, of which 5 are Soviet and 1 is English.

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ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, Academy of Sciences, USSR)

SUBMITTED: February 7, 1959

18 (7)

AUTHOR: Buynov, N. N. SOV/48-23-5-25/31

TITLE: Structural Changes in the Alloy Ni-Be After Aging and High Temperature Annealing (Strukturnyye izmeneniya v splave Ni-Be posle stareniya i vysokotemperaturnogo otzhiga)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 5, pp 648 - 649 (USSR)

ABSTRACT: The aging of the alloy Ni-Be with 1.9% Be at temperatures of from 425 to 500°C (10-15 min) causes at first an anomalous double diffraction effect. This effect increases rapidly with longer aging. Observation of the roentgenogram shows that the range of anomalous dispersion lies parallel to (110) and bilaterally in the inverse direction. Six Laue diagrams are given showing the alloy in the various stages of aging (Figs 1 and 2). Experimental results are dealt with in detail, and the formation of the crystalline particles with steady dislocations is regarded as the cause of the abovementioned effect. L. I. Podrezov carried out the experimental part. There

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Structural Changes in the Alloy Ni-Be After Aging and High Temperature Annealing SOV/48-23-5-25/31

are 2 figures and 3 Soviet references.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences, USSR)

Card 2/2

Buynov, N.N

81911

S/126/60/010/01/018/019
E073/E535

24.7500

AUTHORS: Rakin, V. G. and Buynov, N. N.

TITLE: On the Structure of Slip Lines in Metals

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.1, pp. 156-158

TEXT: In earlier work (Ref.1) the existence of two maxima in the curves of the distribution of the magnitude of slip lines and in the curves of the distribution of the distances between these slip lines were detected in an Al-Cu alloy. In this communication some results are described of the study of electron diffraction patterns of deformed single crystals of Al and of polycrystalline ageing alloys Al-Si (1.2% Si) and Al-Mg-Si (1.4% $Mg_2Si$), which were preliminarily quenched from the homogenization temperature. The alloys did not have sufficiently pronounced etch figures and separated out particles which would help to determine the crystallographic orientation of the surface and the indices of the slip planes. Therefore, disregarding orientation, the width of the slip lines and of the distances between them were measured on the electron diffraction patterns and Figs. a and b,

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81911

S/126/60/010/01/018/019
E073/E535

On the Structure of Slip Lines in Metals

p.157 represent plots of the distribution of these. Almost all the plotted curves show a maximum and, following that, a more or less pronounced flat section or a further maximum. This leads to the conclusion that maxima are characteristic for all crystalline materials. This may be due to the existence of two mechanisms of formation and development of dislocations, one of which leads to fine, the other to coarse slip lines or that two types of conditions may exist for the action of sources of dislocation in the material. The dependence of the quantitative relations between the two types of slip lines on the degree of deformation leads to the idea that the fine traces occur primarily during the initial stages of deformation when the stress state of the material is still relatively uniform, whilst the coarse stresses appear after a considerable degree of deformation and are due to relatively non-uniform stresses in the material. At present there is no reliable theory or experimental data which would elucidate satisfactorily the existence of fine and coarse slipping. There are 2 figures and 11 references, 1 of which is Soviet, 3 German and

Card 2/3

81911
S/126/60/010/01/018/019
E073/E535

On the Structure of Slip Lines in Metals

7 English.

ASSOCIATION: Institut fiziki metallov AN SSSR
(Institute of Physics of Metals, AS, USSR)

SUBMITTED: January 27, 1960

4

Card 3/3

09941

18.7510 1555,1454

S/126/61/011/001/007/019
E021/E406

AUTHORS: Rakin, V.G. and Buynov, N.N.

TITLE: The Influence of Plastic Deformation on the Stability of the Particles Formed in the Decomposition of a Copper-Aluminium Alloy

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.1, pp.59-75

TEXT: The structure of deformed aluminium - 4% copper alloys has been investigated using the electron microscope to study the influence of deformation of the G.P. zones, the metastable θ' particles and the stable θ phase. The method of oxide replicas was used. The alloys were prepared from 99.99% aluminium and Kal'baum copper. In order to produce starting materials of different strength, the alloys were quenched in water from 535°C and naturally aged for three months, or artificially aged at 190°C for 30 minutes, 90 minutes, 4 hours and 12 hours, or aged at 250°C for 15, 40 and 70 minutes and 2 hours. Thus the alloys had different degrees of supersaturation and contained G.P. zones and precipitate. The specimens were electropolished, deformed to fracture and anodized to produce the oxide replica. From an analysis of

Card 1/3

89941

S/126/61/011/001/007/019
E021/E406

The Influence of Plastic Deformation on the Stability of the Particles Formed in the Decomposition of a Copper-Aluminium Alloy

700 electronmicrographs, the following changes in the microstructure after deformation were noted. The particles of the θ' phase were bent in the slip lines. The G.P. zones and the θ' phase were partially or completely dissolved in the slip lines. In some cases the G.P. zones and θ' phase were stabilized by transformation to θ' and θ phase respectively. This occurred in parts with greatest deformation. New G.P. zones appeared in some of the slip lines. Intensive decomposition often occurred between the slip lines. The platelets of the θ' phase were rotated parallel to the slip lines. The particles of the stable θ phase were bent by the slip lines. The observed effects of plastic deformation were explained by the resistances of the particles to the passage of dislocations through them, by their resistance to diffusion of copper atoms together with dislocations and vacancies and by the interaction of the copper atoms with the stress fields of the dislocations. The plastic deformation does not change the mechanism of decomposition but accelerates it. The degree of

Card 2/3

89941

S/126/61/011/001/007/019
ED21/E496

The Influence of Plastic Deformation on the Stability of the Particles Formed in the Decomposition of a Copper-Aluminium Alloy

strengthening obtained by ageing is determined by the interaction of the atoms of the precipitating component with the dislocations. The main part in strengthening is played by the G.P. zone and a smaller part by the metastable particles. Acknowledgments are expressed to A.N.Orlov for his assistance. There are 6 figures and 64 references: 23 Soviet and 41 non-Soviet.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals AS USSR)

SUBMITTED: July 15, 1960

Card 3/3

40972

18.8200

S/659/62/009/000/002/030
I003/I203

AUTHORS: Buynov, N. N. and Rakin, V. G.

TITLE Age hardening of alloys

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zhoroprochnym splavam v. 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 14—23

TEXT: According to the authors, the age hardening of alloys is mainly influenced by the Guinier-Preston zones and to a lesser degree by particles of the metastable phases and the breaking up of the mosaic structure. The internal stresses within the crystal lattice and its imperfections have little influence on the strengthening of the metal. The breaking up of the blocks of the mosaic structure increases the strength by not more than 20–30% even in the alloys which show great volume changes, such as the Ni-Be and Cu-Be alloys. The necessity is stressed for an investigation of the relationship between the dislocations on the one hand, and the Guinier-Preston zones, precipitations, and block boundaries on the other. V. C. Cherny did not agree with the above point of view, and maintained that the conclusions reached do not hold for all alloys, but the causes underlying the strengthening may be quite individual for each alloy. There are 4 figures.

Card 1/1

S/126/62/014/006/007/020
E193/E383

AUTHORS: Shashkov, O.D. and Buynov, N.N.

TITLE: A study of the zonal stage of decomposition in aluminium-zinc and aluminium-zinc-magnesium alloys by the method of anomalous X-ray scattering

PERIODICAL: Fizika metallov i metallovedeniye, v. 14, no. 6, 1962, 848 - 851

TEXT: The object of the present investigation was to elucidate the nature of the anomalous diffusion effects on X-ray diffraction patterns of aged Al-Zn alloys with a view to providing an explanation of some specific features of ageing of alloys of this type. The X-ray diffraction analysis was conducted on a 20 wt.% Zn-Al alloy (with and without Mg additions ranging from 0.2 - 1.4%), solution-treated at 450 °C and naturally aged. It was found that the streaks observed on the Laue photographs of naturally aged Al-Zn and Al-Zn-Mg alloys were, in fact, "shape effects", i.e. they were caused by superimposition of anomalous X-ray scattering from Guinier-Preston zones and from the solid-solution matrix with lattice defects. Addition of Mg increased the lattice

Card 1/2

parameter of the 20% Zn-Al alloy, the increase brought about by 1 at.% Mg amounting to 0.0043 Å. The Guinier-Preston zones in the 20% Zn-Al alloy contained 49 ± 5 at.% Zn, the composition of the Guinier-Preston zones in the 1:20:79 Mg:Zn:Al alloy being 50 at.% Al, 42 at.% Zn and 8 at.% Mg. The Guinier-Preston zones in the Al-Zn alloy aged naturally for 72 hours constituted 26% of the weight and 60% of the total volume of the alloy. Practically all the Mg was concentrated in the Guiner-Preston zones in an alloy containing up to 1.4 wt.% Mg.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals of the AS USSR)

SUBMITTED: June 26, 1962

SHASHKOV, O.D.; BUYNOV, N.N.

X-ray scattering by an aging alloy crystal taking into account the transition layer between the Guinier-Preston zone and the matrix. Fiz. met. i metalloved. 16 no.4:628-630 O '63. (MIRA 16:12)

1. Institut fiziki metallov AN SSSR.

ACCESSION NR: AP4004689 S/0126/63/016/005/0681/0685

AUTHORS: Shashkov, O. D.; Buynov, N. N.

TITLE: Evaluation of intensity distribution of x-ray scattering near the inverted lattice point of an aging Al-Ag alloy in the zonal phase and dimension determination of the Guinier Preston zone

SOURCE: Fizika metallov i metallovedeniye, v. 16, no. 5, 1963, 681-685

TOPIC TAGS: x-ray scattering, aluminum silver alloy, alloy, aging, Guinier Preston zone, inverted lattice point, scattering, aluminum alloy, lattice point, silver alloy, zonal phase, lattice point scattering, Laue spot

ABSTRACT: The authors have used a general expression from A. M. Yelistratov (DAN SSSR, 1952, 87, 581) describing the intensity distribution near a reciprocal-lattice point in an aging crystal, in addition to data obtained from geometric analysis of anomalous effects on x-ray photographs of Al-Ag alloys, in order to compute intensity distribution of x-rays. These values are then compared with experimental data. The results are summarized in Figs. 1-4 on the Enclosures. The radius of the spherical Guinier-Preston zone is normally computed from the radius of the zone of anomalous scattering as determined from measurements on the x-ray powder disgrams,

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ACCESSION NR: AP4004689

but because of frequent difficulty in determining the precise margin of this effect, the authors propose another method, involving the difference in size of the zone for two types: one conditioned by zones and one with a transition layer (the latter having the smaller anomalous scattering zone). The authors conclude that when the Guinier-Preston zone is within the limits of 20-25 Å, the precision of determining the dimensions by the method they suggest may be within 3-4 Å. "The authors express their thanks to R. M. Lerinman for kindly preparing x-ray photographs of the Al-Ag alloy." Orig. art. has: 4 figures and 8 formulas.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of the Physics of Metals AN SSSR)

SUBMITTED: 14Mar63 DATE ACQ: 03Jan64 ENCL: 04

SUB CODE: PH NO REF SOV: 006 OTHER: 000

Card 2/6

BUYNOV, N. N.; ZAKHAROVA, R. R.; RAKIN, V. G.

"Electronmicroscopic studies of structure Guinier-Preston zones in aluminium-silver and aluminium-copper alloys."

report submitted for 3rd European Regional Conf, Electron Microscopy, Prague, 26 Aug-3 Sep 64.

L 16474-65 EWT(m)/T/EWP(t)/EWP(b) Pad JD/HW

ACCESSION NR AM4049793 BOOK EXPLOITATION S/

Buynov, Nikolay Nikolayevich; Zakharova, Roza Ramzesovna

Decomposition of supersaturated metallic solid solutions (Rasпад metallicheskikh pereсyshchennykh tverdykh rastvorov), Moscow, Izd-vo "Metallurgiya", 1964, 140 p. illus., biblio. 2,800 copies printed.

TOPIC TAGS: supersaturated metallic solid solution, solid solution decomposition

PURPOSE AND COVERAGE: The book considers the formation of a new phase in metallic supersaturated solid solutions, the structure of the matrix of solid solutions and its change in decomposition, the structure of slip traces and the distribution of plastic deformation in alloys, the relation of the structure of slip traces to the structural state of the deformed, the effect of plastic deformation on the birth of a segregation phase, and the relation of alloy properties to their structure. The book is intended for researchers and engineers working in metal physics and metallography

TABLE OF CONTENTS [abridged]:

Card 1/2

L 16474-65
ACCESSION NR AM4049793



SUB CODE: MM SUBMITTED: 02Dec63 NR REF SOV: 163

OTHER: 146

Card 2/2

ACCESSION NR: AP 4017362 S/0126/64/017/002/0278/0282

AUTHOR: Shashkov, O. D.; Buynov, N. N.

TITLE: Effect of the addition of a third component on the natural aging of an Al-Zn alloy

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 2, 1964, 278-282

TOPIC TAGS: alloy, aluminum zinc alloy, copper containing alloy, silver containing alloy, magnesium containing alloy, alloy property

ABSTRACT: The methods of anomalous x-ray scattering, hardness measurement, and electron microscopy were used in a study of the distribution (between the Guinier Preston zones and matrix) of admixtures of Ag (5 and 20%), Mg (0.2—1.0%), Cu (0.1—5%), and Si (1—2%) in Al alloys with 5, 20, and 25% Zn and of the effect of different patterns of distribution on aging. It is shown that Mg (up to 1.4% by weight) and Ag (up to 10%) predominate in the zones while Cu (up to 2%) remains in the matrix or distributes itself uniformly in the matrix and zones. As shown (Fig. 1 of the Enclosure), the natural aging rate changes when

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ACCESSION NR: AP4017362

a third component such as Mg settles in the zone. Cu and Ag, which also increase the hardness, have little effect on the character of the aging curve. Stresses related to the coherence of the zone and matrix lattices are not essential in alloy strengthening. "Part of the work was done by M. F. Komarova." Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 26Apr63 ATD PRESS: 3051 ~64 ENCL: 01

SUB CODE: MM NO REF SOV: 005 OTHER: 007

Card 2/3

ACCESSION NR: AP4017362 ENCLOSURE: 01

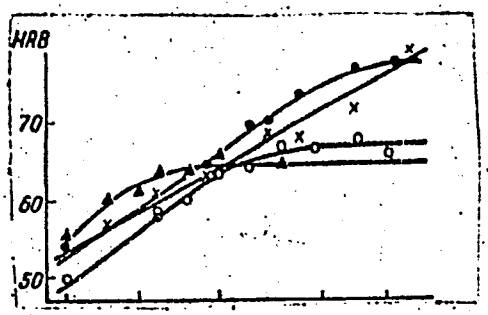


Fig. 1. Hardness - aging curves for alloys with admixtures of Mg

▲ - Al — 20%Zn; o — Al — 20%Zn—0,4%Mg; ● —Al—20%Zn—1,0%Mg; X—Al—20%Zn—1,4%Mg.

Card 3/3

ACCESSION NR: AP4017365 S/0126/64/017/002/0288/0289

AUTHORS: Rakin, V. G.; Buynov, N. N.

TITLE: On the relation of resistance properties of aluminum copper alloy to its structure

SOURCE: Fizika metallov i metallovedeniye, v. 17, no. 2, 1964, 288-289

TOPIC TAGS: aluminum copper alloy, plastic deformation, G P zone, yield limit, slip track, theta phase, interatomic force

ABSTRACT: The results of earlier work performed by V. G. Rakin and N. N. Buynov (FMM, 1959, 7, 939) were used to study the relation between the resistance properties of Al-Cu (4%) alloy during plastic deformation at various stages of failure and to explain the influence of the G-P zones and particle separation on the resistive properties of the material. It was found that the yield limit varied regularly with the toughness of the material. As the yield limit increased, the magnitude of deformation along the slip tracks and the distance between these tracks tended to decrease, while the number of thin tracks increased. From the results as shown by Fig. 1 of the Enclosures it can be deduced that the magnitude of the displacement along these tracks and the distance between the tracks is

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ACCESSION NR: AP4017365

minimum while the ratio of fine tracks to coarse ones is at a maximum for conditions in which the G-P 2 zone dominates. When the alloy was softened, the characteristic slip indicated a reduction in the number of atoms taking part in the deformation. The maximum participation of the volume of the alloy in plastic deformation corresponded to the dominance of the G-P 2 zone. At the predominance of the G-P 1 zone or the participation of the stable θ phase the resistance and the extent of volumetric participation of the alloy in plastic deformation decreased. The author thanks V. A. Pavlov for discussions of the results and his helpful observations. Orig. art. has: 2 figures.

ASSOCIATION: Institut fiziki metallov, AN SSSR (Institute for Physics of Metals, AN SSSR)

SUBMITTED: 12Aug63 ENCL: 02

SUB CODE: MM NO REF SOV: 006 OTHER: 001

Card 2/4

ACCESSION NR: AP4017365

ENCLOSURE: 01

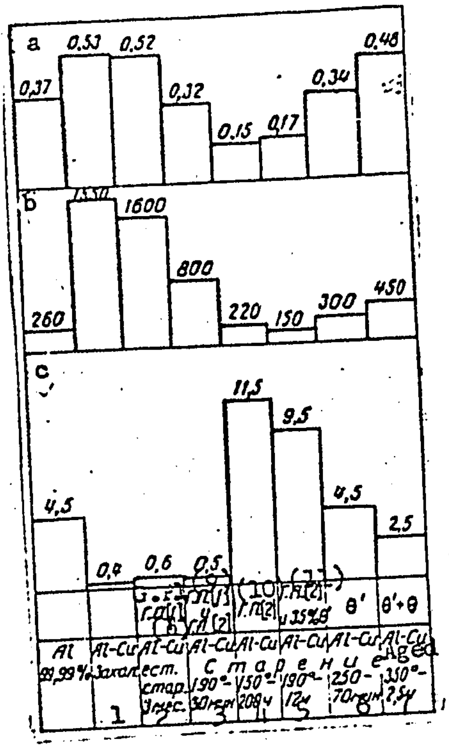

Fig. 1. Diagrams of dependence of characteristic slip on the structure of Al-Cu(4%) alloy

a. mean distance between slip tracks
b. mean displacement in slip tracks in angstroms
c. ratio of number of thin tracks to number of coarse tracks

1. Al-Cu hardened
(to Enclosure 02)

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ACCESSION NR: AP4017365

(from Enclosure 01) ENCLOSURE: 02

2. AL-CU nat. aged 3 months.
3. Aged at 190° for 30 min.
4. at 150° for 200 hrs.
5. at 190° for 12 hrs.
6. at 250° for 70 mins.
7. at 350° for 2-5 hrs.
8. G.P. 1
9. G.P. 1 and G.P. 2
10. G.P. 2
11. G.P. 2 and 35% O'

Card 4/4

BUYNOV, N.N.; ZAKHAROVA, R.R.; RAKIN, V.G.

Structure of Guinier-Preston zones and metastable precipitates in aluminum-silver and aluminum-copper alloys. Fiz. met. i metalloved. 17 no.5:782-784 My '64. (MIRA 17:9)

1. Institut fiziki metallov AN SSSR.

method

SOURCE: Fizika metallov i metalloveedenie v. 18, no. 6, 1964, [illegible]

Card [illegible]

L 36628-65

ACCESSION NR AP5002246

in the form of the [illegible] atoms observed upon [illegible]

Card [illegible]

[illegible] EWT(m)/EWP(b)/T/EWA(d)/EWP(t) Pf-4/Ps-4

[illegible]

AUTHOR: Bakharova, [illegible]; Buynov, N. N.; Buynova, [illegible]; Rodionov, K. P.

TITLE: Electron microscope investigation of the effect of plastic deformation on the structure of an Al-Cu (4%) age hardening alloy

SOURCE: Fizika metallov i metallovedenie, v. 18, [illegible], 1964, [illegible]

TOPIC TAGS: plastic deformation, copper alloy, aluminum alloy, alloy structure

ABSTRACT: The effect of plastic deformation on the structure of Al-Cu [illegible] alloy specimens artificially aged at 200 and [illegible] examined [illegible] electron microscope. It is established that the effect of plastic [illegible] of the θ-phase depends on the degree of preliminary and [illegible] temperatures and longer periods [illegible] with different [illegible] 2 figures.

Card 1/2

L 57616-65
ACCESSION NR: AP5008792

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals, AN SSSR)

SUBMITTED: 13Apr64 ENCL: 00

NO REF SOV: 007 OTHER: 003

Card 2/2

L 20642-66 EWT(1)/EWT(m)/EWP(w)/EPF(n)-2/T/EWP(t) IJP(c) JD/WW/JG/GG

ACC NR: AP6010405 SOURCE CODE: UR/0126/66/021/003/0388/0395

AUTHOR: Sudareva, S. V.; Buynov, N. N.; Vozilkin, V. A.; Romanov, Ye. P.; Rakin, V.G.

ORG: Institute of Metal Physics, AN UkrSSR (Institut fiziki metallov AN UkrSSR) 38 B

TITLE: The relationship between the characteristics of superconductivity and structure of zirconium-4% niobium alloy

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 3, 1966, 388-395

TOPIC TAGS: zirconium alloy, niobium containing alloy, alloy structure, alloy superconductivity

ABSTRACT: Zirconium-base alloy containing 4% niobium melted from 99.8%-pure zirconium and 99.4%-pure niobium, rolled at 600—700C into bars, homogenized at 1280C for 50 hr, annealed at 1200C and water quenched, aged at 550C for up to 1000 min, and rolled at 550C with a reduction of 93% was tested for the effect of structure on the characteristics of superconductivity. It was found that alloy annealed at 1200C is not superconductive at 4.2K. Aging of annealed alloy at 550C for 15 min brings about a precipitation of the finely dispersed β-phase and the alloy becomes superconductive with a critical current density of 5000 amp/cm$^2$. The β-phase particles precipitate mainly at the boundaries of the martensitic needles and form a system of superconductive fibers in the nonsuperconductive matrix. Such a structure appears to have a favorable effect on the magnitude of the critical current density. Prolonged aging of annealed alloy has no additional effect on the critical current

Card 1/2 UDC: 537.312.62:548.4

L 20642-66

ACC NR: AP6010405 0

density. Alloy which, after annealing, was rolled at 550C also became superconductive after aging at 550C for 3 hr, but its critical current density was found to be 50,000 amp/cm$^2$ (one order higher than that of alloy aged without rolling). The structure of alloy in this condition is distinguished by a network of dislocations decorated by rather large (50—100 Å) particles of β-phase and forming a system of superconducting fibers. Such a structure appears to be a specific feature of all niobium-zirconium alloys with high values of critical current density. Orig. art. has: 4 figures. [DV]

SUB CODE: 20, 11/ SUBM DATE: 05Jul65/ ORIG REF: 004/ OTH REF: 008/ ATD PRESS: 4226

Card 2/2 BK

L 34073-66 EWT(m)/EWP(w)/T/EWP(t)/ETI IJP(c) JD/JG/JH

ACC NR: AP6018944 SOURCE CODE: UR/0126/66/021/006/0858/0867

40
39
B

AUTHOR: Komarova, M. F.; Buynov, N. N.; Lerinman, R. M.; Savina, L. P.

ORG: Institute of the Physics of Metals, AN UkrSSR (Institut fiziki metallov AN UkrSSR)

TITLE: Effect of silver addition on the structure and kinetics of decomposition of the solid solution of aluminum-magnesium alloys

SOURCE: Fizika metallov i metallovedeniye, v. 21, no. 6, 1966, 858-867

TOPIC TAGS: aluminum alloy, magnesium containing alloy, silver containing alloy, alloy aging, alloy hardness, alloy structure

ABSTRACT: Experiments have been made to determine the effect of silver additions on the mechanism of aging and strengthening of binary Al-Mg alloys containing 10—12% Mg. Ingots of binary Al-11% Mg alloys and of ternary alloys containing additions of 0.1, 0.3, or 1% Ag were homogenized at 430C before and after upsetting with a reduction of 50% and, after solution heat treatment at 430C and water quenching, were aged at 150—225C for various periods of time up to 500 hr. Hardness measurements showed that the hardness of unaged alloys with 0.1 and 0.3 and 1% Ag was higher by 5 and 9—10 HRB units, respectively, than the hardness of the binary alloys. In aging, addition of silver accelerated the decomposition of the solid solution, which resulted in a much more rapid onset of the increase in hardness and in much quicker

Card 1/2 UDC: 548.53:546.3-19'621'46

L 34073-66

ACC NR: AP6018944

attainment of the maximum hardness in alloys with silver as compared with alloys without silver. Electron microscopic examination of the alloy structures showed that the increase in hardness was primarily associated with the formation of the metastable β'-phase which forms sooner in alloys with silver than in binary alloys. Silver-containing alloys were less susceptible to overaging and have a maximum hardness appreciably higher than binary alloys. The hardness of ternary alloys was close to that of heat-treatable Al-Zn-Mg alloys. Silver addition also promoted formation of more finely dispersed precipitates and their more uniform distribution within grains, thus eliminating the precipitate-poor boundary regions. All these factors increase the tensile and fatigue strengths and the resistance to stress corrosion of the alloys. Orig. art. has: 6 figures and 1 table. [MS]

SUB CODE: 11/ SUBM DATE: 10Sep65/ ORIG REF: 005/ OTH REF: 020/ ATD PRESS: 5018

Card 2/2

ACC NR: AP6033055 SOURCE CODE: UR/0126/66/022/002/0289/0292

AUTHOR: Romanova, R. R.; Buynov, N. N.; Dolgikh, G. V.; Rodionov, K. P.; Bulychev, D. K.

ORG: Institute of Metal Physics AN SSSR (Institut fiziki metallov AN SSSR)

TITLE: Electron-microscope investigation of the effect of plastic deformation on the structure of Al-Zn (20%) heat-treatable alloy

SOURCE: Fizika i metallov i metallovedeniye, v. 22, no. 2, 1966, 289-292

TOPIC TAGS: plastic deformation, aluminum base alloy, zinc alloy, metal structure, electron microscopy, aluminum zinc alloy, heat treatable alloy, alloy hydrostatic extrusion, alloy rolling, alloy structure / Al20Zn alloy

ABSTRACT: Small, 10 mm in diameter ingots of an aluminum-base alloy containing 20% zinc were rolled into 6 x 6 mm bars which were homogenized, solution annealed at 485C, water quenched, and aged at 200C for 5 hr. The structure of heat-treated bars was characterized by a Widmanstätten type network with lamellar particles of a metastable α' phase. Heat-treated bars were subjected to plastic deformation with a reduction of 65% either by rolling or by hydrostatic extrusion. Under the effect of deformation, the network and most of the α' phase par-

Card 1/2 UDC: 536.42

ACC NR: AP6033055

ticles disappeared; simultaneously, a small number of equiaxial and also elongated particles of a stable α phase was formed in both rolled and hydrostatically extruded specimens. Additional aging at 200C brought about no significant change in the structure of rolled specimens, except for an increase of the number of both α and α' particles. In the hydrostatically extruded specimens, a great number of α particles and only a small number of the α' particles were observed. It is concluded that in hydrostatic extrusion, a much higher number of vacancies is generated, which intensifies the aging. V. T. Shmatov is thanked for his interest in this study and discussion of the results. Orig. art. has: 5 figures.

SUB CODE: 11,20/ SUBM DATE: 19Feb66/ ORIG REF: 005/ OTH REF: 003

Card 2/2

ACC NR: AP6032622 (N) SOURCE CODE: UR/0126/66/022/003/0424/0431

AUTHOR: Buynov, N. N.; Dobatkin, V. I.; Rakin, V. G.; Romanova, R. R.; Shashkov, O. D.; Dobromyslov, A. V,

ORG: Institute of Metal Physics, AN SSSR (Institut fiziki metallov, AN SSSR)

TITLE: Investigation of the structure of ATsM and V92 heat-treatable aluminum alloys

SOURCE: Fizika metallov i metallovedeniye, v. 22, no. 3, 1966, 424-431

TOPIC TAGS: metal aging, aluminum base alloy, aluminum zinc magnesium alloy, aluminum alloy aging, aluminum alloy structure/ATsM aluminum alloy, V92 aluminum alloy

ABSTRACT: Aging-induced structural changes and the kinetics of aging in aluminum-base alloys ATsM (4.72% zinc, 1.84% magnesium, 0.69% manganese, 0.35% zirconium, 0.03% titanium, and 0.5% copper) and V92 (3.34% zinc, 4.48% magnesium 0.8% manganese, and 0.005% beryllium) have been studied by means of electron microscopy and x-ray diffraction analysis. The aging kinetics were found to be the same in both alloys. The decomposition of solid solution begins with the formation of Guinier Preston zones with a high density of vacancies, which serve as nuclei for the precipitation of $MgZn_2$-phase and play an important part in the age hardening of the alloys. The temperature and duration of aging has little or no effect on the size of Guinier Preston zones, but a considerable effect on their composition. V92 alloy age hardens

 UDC: 546.3-19'621'47'46 : 548.0

ACC NR: AP6032622

more intensively than ATsM does owing to a higher total zinc and magnesium content of the former. Orig. art. has: 4 figures.

SUB CODE: 11/ SUBM DATE: 27Dec65/ ORIG REF: 008/ OTH REF: 007

Card 2/2

DUDEROV, G.N.; VOLKOVA, N.; BUYNOVA, L.

Conversion to the one-five method in the production of tube condensers. Trudy MKHTI no.24:199-208 '57. (MIRA 11:6)
(Ceramic industries)

L 57816-65 EPR/EWP(k)/EWA(c)/EWT(m)/EWP(b)/T/EWA(d)/EWP(t) Pf-4/Pe-4

[illegible]

AUTHOR: Zabbarova, [illegible]; Pavlov, N. N.; Pavlova, [illegible]

[illegible]

TITLE: Electron microscope investigation of the effect [illegible]

SOURCE: Fizika metallov i metallovedenie, v. 19, no. [illegible]

[illegible]

Card 1/2

L 57816-65
ACCESSION NR: AP5008792

ASSOCIATION: Institut fiziki metallov AN SSSR (Institut [illegible]
AN SSSR)

SUBMITTED: [illegible] ENCL: [illegible]

NO REF SOV: 007 OTHER: 003

Card 2/2

BUYNOVA, S.K.; GRINBERGS, A.R.; STEBAYEV, I.V.

Geographical and ecological distribution of springtails (Collembola) in mountain-forest and forest-steppe landscapes of the Southern Urals. Ent. oboz. 42 no.2:364-372 '63. (MIRA 16:8)
(Ural Mountain region--Collembola)

BETEL'MAN, R.A.; BUYNOVICH, G.V.

Some changes in the function of the myocardium and lungs rising with the aging. Vop. geron. i geriat. 4:86-91 '65. (MIRA 18:5)

1. Institut gerontologii AMN SSSR, Kiyev.

MAN'KINA, N.N., kand.tekhn.nauk; TKACHENKO, A.G., inzh.;
BUYNOVSKAYA, L.G., inzh.

Method of detecting the formation of iron oxide deposits on the inner heating surfaces of high-pressure boilers. Teploenergetika 7 no.9:30-34 S '60. (MIRA 14:9)

1. Vsesoyuznyy teplotekhnicheskiy institut i Kiyevenergo.
(Iron oxides) (Boilers--Incrustations)

ANTONOV, A.Ya., kand. tekhn. nauk; KOZLOV, Yu.V., inzh.; FOMINA, V.N., inzh.; BUYNOVSKAYA, L.G., inzh.; BULAVITSKIY, Yu.M., inzh.; GRISHINA, Ye.A., inzh.

Testing of a boiler with 220 ton/hour evaporative capacity with individual separating devices. Elek. sta. 34 no.5:7-10 My '63. (MIRA 16:7)

(Boilers—Testing)

L 04635-67 EWT(m)/EWP(k)/EWP(t)/ETI IJP(c) JD/HW

ACC NR: AP6020935 SOURCE CODE: UR/0383/66/000/003/0038/0040

AUTHORS: Chepurko, M. I. (Candidate of technical sciences); Buynovskiy, A. M.; Smorshchok, V. S.; Legavets, G. A.

38
B

ORG: none

TITLE: Rolling of bimetallic pipes of steel-copper, on a continuous pipe rolling mill

27 18

SOURCE: Metallurgicheskaya i gornorudnaya promyshlennost', no. 3, 1966, 38-40

TOPIC TAGS: metal tube, pipe, bimetal, steel, copper, metal rolling

ABSTRACT: A general discussion of the industrial production of bimetallic pipes (steel-copper and others) is presented. The discussion is based on the bimetallic pipe production method proposed by one of the present authors, M. I. Chepurko (Sposob izgotovleniya bimetallicheskikh trub. Avtorskoye svidetel'stvo No. 87842, vydannoye Gostekhnikoy SSSR v 1950 g.). Experiments have shown that the best preliminary treatment for copper surfaces is a chemical one consisting of an alkali and acid application. To avoid defects in the copper member of the bimetallic pipe, care should be exercised not to overheat the copper member (see Fig. 1). It is concluded that, with present day techniques, it is possible to manufacture bimetallic pipes of various metals up to a diameter of 70 mm.

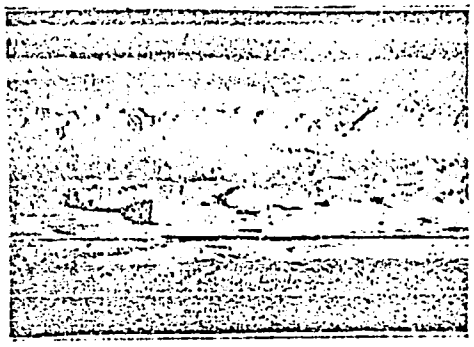
Card 1/2 UDC: 621.774.5.001.6

L 04635-67

ACC NR: AP6020935

0

Fig. 1. Characteristic defects on the inner surface of steel-copper pipes of 57 x 6.0 mm cross section.



Orig. art. has: 2 graphs.

SUB CODE: 13, 11/ SUBM DATE: none/ ORIG REF: 004

awm

Card 2/2

CHEFURKO, M.I., kand. tekhn. nauk; BUYNOVSKIY, A.M.; STEFANOVICH, I.S.; KIRVALIDZE, N.S.; PANYUSHKIN, A.V.; TARASENKO, [illegible]; SHUSTIN, Ye.P.

Extrusion of bimetallic pipe made of steel and copper. Met. i gornorud. prom. no.6:36-38 N-D '64. (MIRA 18:2)

ACC NR: AP6018224 (N) SOURCE CODE: UR/0383/66/000/001/0041/0043

AUTHOR: Chepurko, M. I. (Candidate of technical sciences); Smorshchok, V. S.; Buynovskiy, A. M.; Panyushkin, A. V.

ORG: none

48
47
B

TITLE: Extrusion of bimetallic steel-copper pipes

SOURCE: Metallurgicheskaya i gornorudnaya promyshlennost', no. 1, 1966, 41-43

TOPIC TAGS: pipe, metal extrusion, bimetal, metal cladding

ABSTRACT: Bimetallic pipes of No. 10 steel and M3S copper were extruded on a vertical 1500 T power press (container ∅=150 mm, die ∅=74 mm, punch ∅=64 mm, temperature 900 to 920C, graphite oil and 10% salt lubricant). The pipe sections were 4000 mm long, had an outside diameter of 73.5 mm and total wall thickness of 5 mm. Thickness of the inside copper layer ranged from 0.20—0.25 to 0.90 mm. The extrusion technique is described. Inspection of finished pipe indicated a relatively uniform distribution of copper cladding over the length of the pipe. Copper thickness below 0.90 mm resulted in substandard material. It is concluded that the technology described can be employed to manufacture steel pipe with inside copper cladding as a finished product or as a final billet. Orig. art. has: 3 figures and 2 tables.

Card 1/2

UDC: 621.774.332

L 40924-66

ACC NR: AP6018224

SUB CODE: 13,11/ SUBM DATE: none

Joining of dissimilar metals 18

Card 2/2 vmb

Buynovskiy, A.P.

VYAZ'MENSKIY, A.S., inzhener; BUYNOVSKIY, A.P., inzhener.

Use of electric signals in casting cylinders in shell molds. Lit. proizv. no.5:31-32 My '57. (MIRA 10:6)
(Foundry machinery and supplies)

BUYNOVSKIY, G.P.

The PK-4 cutter-loader for mining. Ugol' 34 no.8:50-51 Ag '59. (MIRA 12:12)

(Coal mining machinery)

SHUMMEYICH, V.S.; [illegible]

Seminars of veterinary [illegible] specialists. [illegible] no.10:119-122 O '45. (MIRA 12:10)

BUYNOVSKIY, N.A.; KHAVESON, Ya.I.

First find of a fossil cranium of the Pleistocene camel in Siberia. Biul.Kom.chetv.per. no.19:79-81 '53. (MLRA 7:11)
(Siberia--Camels, Fossil) (Camels, Fossil--Siberia)

BUYNOVSKIY, N. A.

Buynovskiy, N. A.

"The History and Modern Practice of Horse-Breeding in Siberia." Min Culture USSR, Leningrad Agricultural Inst. Leningrad, 1954 (Dissertation for the degree of Candidate in Technical Sciences)

SO: Knizhnaya letopis' No. 27, 2 July 1955

BUYNOVSKIY, N.A.

Changes in the skeleton of herd horses during the postembryonic period. Trudy Inst.morf.zhiv. no.31:170-174 '60. (MIRA 13:6)

1. Ryazanskiy sel'skokhozyaystvennyy institut im. P.A.Kostycheva.
(Skeleton) (Horses--Anatomy)

PATSAUSKAS, E.I. [Pacauskas, E.]; YANITSKIY, I. V. [Janickis, J.]; BUYNYAVICHENE, G.I. [Buineviciene, G.]

Electrolysis of selenium solutions in concentrated sulfuric acid. Trudy AN Lit. SSR. Ser. B. no.1:87-95 '64 (MIRA 17:7)

Polarographic determination of selenium dissolved in concentrated sulfuric acid. Ibid. 97-101

1. Kaunasskiy politekhnicheskiy institut i AN Litovskoy SSR.

S/170/62/005/004/014/016
B104/B102

24,5100

AUTHORS: Parkhomenko, I. A., Buynyachenko, G. P.

TITLE: Remarks on a paper by G. N. Tret'yachenko and L. V. Kravchuk entitled "Normal thermal conditions of bodies of complex shape"

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 4, 1962, 127 - 129

TEXT: According to I. Boussinesq (Theorie analitique de la chaleur, 1, 2, Paris, 1901 - 1903), the temperature field of a solid body under constant boundary conditions can be represented by

$$t(\bar{r},\tau) = A_0U_0(\bar{r})\exp(-m_0\tau) + A_1U_1(\bar{r})\exp(-m_1\tau) + A_2U_2(\bar{r})\exp(-m_2\tau) + \ldots \quad (1)$$

From a certain moment, the temperature can be described in good approximation by $t = A_0U_0(r)\exp(-m_0\tau)$. These temperature conditions are called normal by G. M. Kondrat'yew G. N. Tret'yachenko and L. V. Kravchuk (IFZh,

Card 1/2

Remarks on a paper by .... S/170/62/005/004/014/016
B104/B102

no. 8, 132, 1961) showed that the terms of the series (1) decrease rapidly with $m_j > m_o$ and that the contribution of the eigenfunctions $U_j(\overline{r})$ to the sum is somewhat larger so that the "determining" term of the series is not the first but an n-th term. The number of this term largely depends on the point observed of the body. Thus the authors prove that "m is not a constant and does not depend on the coordinates". Their statement is restricted to bodies of complex shape. For bodies of simple shape, m is constant. The authors do not agree to these statements. They prove that the functions $A_j U_j(\overline{r})\exp(-m_j)$ do not only depend on the reference point, i. e., on $U_j(\overline{r})$, but also substantially on time. There are 3 tables and 2 Soviet references.

ASSOCIATION: Tekhnicheskiy institut rybnoy promyshlennosti i khozyaystva, g. Kaliningrad (Technical Institute of Fish Industry and Fishery, Kaliningrad)

SUBMITTED: December 30, 1961

Card 2/2

BUYNYACHENKO, G. P.

Multirange potentiometer bridge. Izv. vys. ucheb. zav.; prib. 6 no.2:154-155 '63. (MIRA 16:4)

1. Kaliningradskiy tekhnicheskiy institut rybnoy promyshlennosti i khozyaystva. Rekomendovana kafedroy avtomatizatsii proizvodstvennykh protsessov.

(Potentiometer) (Bridge circuits)

BUYNYACHENKO, G.P.

Experimental stand for studying the processes of heat exchange. Izv.vys.ucheb.zav.; prib. 7 no.6:84-88 '64. (MIRA 18:2)

1. Kaliningradskiy tekhnicheskiy institut rybnoy promyshlennosti. Rekomendovana kafedroy avtomatizatsii proizvodstvennykh protsessov.

6(4) SOV/107-58-12-31/55

AUTHOR: Buynyavichus, A. (Kaunas)

TITLE: A Simple Transmitter (Prostoy peredatchik)

PERIODICAL: Radio, 1958, Nr 12, p 27 (USSR)

ABSTRACT: The author explains how to construct a simple transmitter for working with closely situated correspondents on a band of 40 mc; it is based on a Hartley circuit with self-excitation, and has frequency modulation. The l-f voltage amplifier is based on a 6N3P lamp having a large mutual conductance. The carbon granule microphone is connected to the grid of the l-f amplifier through the output transformer of a "Rekord" receiver; its primary winding is used as an autotransformer and the secondary winding remains inactive. There is 1 diagram and 1 circuit diagram.

Card 1/1

BUYNYAVICHUS, Z.A.

Visual rule for mechanical drawing. Mashinostroitel' no.3:25 Mr '65. (MIRA 18:4)

BUYNYY, Ye.

Enthusiasts of their business. Sov. profsoiuzy 16 no.22:47-49 N '60. (MIRA 14:1)

1. Chlen prezidiuma Primorskogokraykoma profsoyuza rabotnikov gosudarstvennoy torgovli i potrebitel'skoy kooperatsii.
(Vladivostok—Department stores)
(Socialist competition) (Trade unions)

JARULAITIS, V.; BUJOKAS, A.; KREGZDAITE, D., red.; LIEGUS, S., tekhn. red.

[Production and assembly of prestressed reinforced-concrete constructions]Itemptai armuotu gelzbetoniniu konstrukciju gamyba ir montavimas. Vilnius, Lietuvos TSR Ministru tarybos valstybinio statybos ir arkhitekturos reikalu komiteto Centrinis technines informacijos ir propagandos biuras, 1962. 131 p. (MIRA 15:8)

(Prestressed concrete construction)

ACC NR: AT6034459 (A) SOURCE CODE: UR/0000/66/000/000/0228/0231

AUTHOR: Doronin, V. M.; Topilin, V. V.; Verner, K. A.; Buyov, A. F.

ORG: none

TITLE: New heat resistant steel for the exhaust valves of internal combustion engines

SOURCE: AN SSSR. Institut metallurgii. Svoystva i primeneniye zharoprochnykh splavov (Properties and application of heat resistant alloys). Moscow, Izd-vo Nauka, 1966, 228-231

TOPIC TAGS: heat resistant steel, valve, internal combustion engine

ABSTRACT: Existing steels with complete phase transformation, Types 4Kh9S2, 4Kh10S2M (EI107), and EI992 have high critical points but at temperatures above 750° have low strength and insufficient corrosion resistance. For this reason, a new economically alloyed austenitic steel Type EP303 has been developed; it has the following chemical composition: 0.5-0.6% C; 8-10% Mn; 19-22% Cr; 3.5-4.5% Ni; 0.5-1.0% Mo; 0.3-0.5% N. The steel is melted in electric arc furnaces. The nitrogen is introduced in the form of nitrated ferrochrome with a content of from 1.5 to 7% nitrogen. The degree of absorption of nitrogen by the metal, at small concentrations, is about 70% of the amount introduced. With an increase in the amount introduced, the absorption drops to about 54%. The final nitrogen content in steel EP303 tends toward a constant value of

ACC NR: AT6034459

the order of 0.34-0.37%. A table shows the tensile strength of a number of valve steels, including the new alloy. A further table shows the comparative corrosion resistance of these alloys at 900°C. The new alloy is shown to be superior on all counts for valve contruction. Orig. art. has: 3 figures and 2 tables.

SUB CODE: 11/ 21/ SUBM DATE: 10Jun66/ ORIG REF: 001/ OTH REF: 001

Card 2/2

ACC NR: AN6033294 (N) SOURCE CODE: UR/9023/66/000/085/0003/0003

AUTHOR: Buytvidas, P.

ORG: none

TITLE: From the heights into the deep [Parachuting aqualungists]

SOURCE: Sovetskiy patriot, no. 85, 23 Oct 66, p. 3, cols. 1-3

TOPIC TAGS: ~~[illegible]~~ specialized training, parachute training, underwater training, PARACHUTE, UNDERWATER PHOTOGRAPHY

ABSTRACT: A group of parachuting aqualungists has been organized at the Klaypeda Club of Underwater Sport. The group, wearing aqualungs, parachutes from aircraft. Next year the group will train to jump from helicopters without parachutes. The participants plan to jump from various altitudes, to use delayed-release parachutes, to photograph underwater, and to perform various assembly work with metal and wood. They perform the same exercises at night.

SUB CODE: 01/ SUBM DATE: none

Card 1/1

BUYUKLI, M.V.

Forms of lavender cultivated in Moldavia. Izv. Mold. fil. AN SSSR no.1:23-52 '61. (MIRA 16:3)

(Moldavia--Lavender (Plant))