SOV/126-6-2-19/34

Study of the Influence of Preliminary Deformation in the Cold State on Creep

inter-atomic bonds in the crystal lattice. Thereby, it is necessary to take into consideration that conservation of a structure which ensures a high strength at elevated temperatures also depends on the strength of the inter-atomic bonds. The creep speed of specimens hardened by deformation in the cold state and not preliminarily stabilised increases sharply in the temperature range where recrystallisation occurs. Thereby, the stage with a steady state creep speed shifts towards longer time durations. Under the simultaneous effects of temperature and stresses, softening of preliminarily deformed specimens is more intensive than solely as a result of elevated temperatures. There are 5 figures, 4 tables and 6 references, 3 of which are Soviet, 3 English.

ASSOCIATION: TsNIIchermet

SUBMITTED: December 17, 1956

Card 3/3 1. Alloys--Deformation 2. Alloys--Creep 3. Alloys--Heat treatment 4. Alloys--Test results

SOV/126-6-4-32/34

AUTHORS: Rozenberg, V. M. and Gradova, L. V.

TITLE: Phenomena Associated with Grain Boundaries in the Case of High Temperature Deformation of a Solid Solution of Titanium in Nickel (Yavleniya, svyazannyye s granitsami zeren pri vysokotemperaturnoy deformatsii tverdogo rastvora titana v nikele)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 4, pp 765-767 (USSR)

ABSTRACT: Data are given relating to the displacement of grain boundaries in solid solutions of titanium in nickel containing 3.6% Ti. The stretching of the specimens was effected in vacuum at 700 or 900°C after preliminary annealing at 1200°C for 2 to 3 hours. The micro-structure photos, Figs 1 and 2, show the displacement of the grain boundary in a specimen stretched at 700°C by means of a load of 8 kg/mm². The displacement of the bent boundary, on which the observations were carried out, took place in the direction away from the centre of curvature. This seems to indicate that the moving force of the displacement is not the difference in the magnitude of the surfa energy of the grains but the difference in the elastic

Card 1/4

Phenomena Associated with Grain Boundaries in the Case of High Temperature Deformation of a Solid Solution of Titanium in Nickel

energy of each of the grains. Fig 3 shows the case of displacement of boundaries which is accompanied by the formation of sliding lines in the specimen (Ni, 600°C, σ = 3.5 kg/mm^2). At a higher test temperature the displacement of boundaries can be so large that in individual cases it is possible to observe a gradual cessation of the grain. It can be seen from Fig.4 how an initially large grain is gradually "eaten up" by its neighbours. The photographs depict individual stages of the displacement. It can be seen clearly that this takes place with breaks: each break corresponds to a certain position of the boundary. The observed change in the structure can also be explained by the displacement of the grains relative to each other. Such a displacement should bring about a buckling of individual grains which, under the microscope, can be seen as the growth of one grain at the expense of another (this was pointed out by E. S. Yakovleva). Three photographs are reproduced in Fig 4 and it can be stated that the

SOV/126- 6-4-32/34

Phenomena Associated with Grain Boundaries in the Case of High Temperature Deformation of a Solid Solution of Titanium in Nickel

observed picture is due mainly to the growth of one grain at the expense of the other and not to buckling. This view seems to be supported by the conservation of traces of original boundaries at the individual stages of growth and also by the possibility of simultaneous focussing of all grains during observation with a microscope and a magnification of 200 times. It is known that the grain growth in the case of selective recrystallisation is stimulated by the difference between the surface energies of the conjugate grains. Selective recrystallisation can take place at a sufficiently high temperature when the mobility of the atoms becomes high enough. Since on the one hand, prior to applying tensile stresses, the specimens were annealed at 1200°C and on the other hand, cases were observed of displacement of the boundaries which lead to an increase in the grain surface, the assumption can be expressed that in the here described cases the state of minimum free energy

Card 3/4

SOV/126-6-4-32/34

Phenomena Associated with Grain Boundaries in the Case of High Temperature Deformation of a Solid Solution of Titanium in Nickel

to which the system tends during stretching is not based on achieving the minimum surface energy but on redistributing the elastic energy between the grains. The total magnitude of the elastic energy is determined by the magnitude of the applied stress.

There are 4 figures.

(Note: This is a complete translation except for the introductory paragraph)

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Metallography and Metal Physics TsNIIChM)

SUBMITTED: May 7, 1957

Card 4/4

SOV/126-6-6-11/25

AUTHORS: Kaminskiy, E.Z. and Rozenberg, V.M.

TITLE: Study of the Influence of Dissolved Carbon on the Recrystallisation and the Long-duration Strength of an Iron-Nickel-Manganese Solid Solution (Izucheniye vliyaniya rastvorennogo ugleroda na rekristallizatsiyu i dlitel'nuyu prochnost' zhelezonikel'margantsevogo tverdogo rastvora)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 6, pp 1036 - 1039 (USSR)

ABSTRACT: In the work described in this paper, the authors determined the temperature of the beginning of recrystallisation and they investigated the dependence of the long-duration strength of nickel-manganese steels on the concentration of the dissolved carbon, the temperature and the stresses. In the investigated steels, the carbon was in the dissolved state and not in the form of carbides. All the investigated steels were austenitic and their compositions were as follows:

Card1/3

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001445610013-6"

SOV/126-6-6-11/25

Study of the Influence of Dissolved Carbon on the Recrystallisation and the Long-duration Strength of an Iron-Nickel-Manganese Solid Solution

Melt Nr	C %	Mn %	Ni %	Fe %	Heat Treatment after forging	Grain size, ball
588	0.05	8.7	15.03	rest	1125 °C-2.5 hrs	6-5
589	0.47	9.5	15.00	"	1100 °C-2 "	6-5
3450	0.95	10	15.00	"	1100 °C-1.5 "	6-5

To exclude the influence of the grain size, each series of specimens was subjected to a heat treatment such that the grain size was the same in all cases (see table above). To eliminate oxidation, specimens were tested in argon atmosphere. The initial crystallisation temperature was determined by the X-ray method after deformation of the specimens by 60%. In Figure 1, the dependence is graphed of the temperature of the initial crystallisation of steels on the concentration of carbon in the solid solution. In Figure 2, the dependence is graphed of the long-duration strength of steels on the concentration of carbon in the solid solution and on the test temperature.

Card2/3

SOV/126-6-6-11/25

Study of the Influence of Dissolved Carbon on the Recrystallisation and the Long-duration Strength of an Iron-Nickel-Manganese Solid Solution

In Figure 3, the dependence is graphed of the long-duration strength of one steel on the test temperature. The following conclusions are arrived at: 1) introduction of carbon into iron-nickel-manganese solid solution reduces the initial recrystallisation temperature and thus indicates that the dissolved carbon reduces the resistance of the solid solution to the effects of the temperature; 2) the carbon dissolved in the solid solution brings about an increase in the breaking strength at relatively high deformation speeds and a decrease in the strength at relatively low deformation speeds; the higher the test temperature, the higher will be the deformation speeds at which the advantages of the carbon-free solid solution will manifest themselves; 3) the here described influence of the carbon is apparently due to a decrease in the strength of the interatomic bonds and an increase in the distortion of the lattice of the solid solution. There are 3 figures, 1 table and 11 Soviet references.

ASSOCIATION: TsNIIChM

SUBMITTED: May 6, 1957

Card3/3

ROZENBERG, V.M.

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.

TABLE OF CONTENTS:

SOV/3355

Studies (Cont.)

Card 3/12

SOV/180-59-2-9/34

AUTHORS: Minkina, Ye.A., Preobrazhenskaya, N.V., and Rozenberg, V.M. (Moscow)

TITLE: Study of the Deformation of Nickel During Creep (Izucheniye deformatsii nikelya pri polzuchesti)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 2, pp 48-55 (USSR)

ABSTRACT: V.M. Rozenberg and L.V. Gradova (Ref 1) and V.M. Rozenberg (Ref 2) have previously shown that the effects found to occur in metals and alloys during creep are applicable to the particular case of nickel. In the present work the deformation of grains and that due to relative displacement of grains were investigated. The nickel used contained 0.02% C, 0.04% Mn, 0.006% S, 0.006% P, 0.08% Ti, 0.23% Fe and traces of Al and Co. Qualitative estimates of deformation were made by the method of McLean (Refs 3,4). Extension of flat test pieces with surfaces prepared for observation was carried out in a vacuum installation (10^{-3} mm Hg). The measured values of displacement along slip planes and grain boundaries and the number of slip lines and grain boundaries are tabulated, together with calculated values

Card 1/3

SOV/180-59-2-9/34

Study of the Deformation of Nickel During Creep

of the deformation. The measurements were carried out at 400, 600, 675, 700 and 800 °C, with stress values of 13 - 2 kg/mm². Figs 1, 2 and 3 show the average value of displacement along visible slip planes, number of slip lines and value of displacement along grain boundaries, respectively, as functions of time (hours) for 400 and 800 °C and stresses of 13 and 4 kg/mm² respectively, are shown in Fig 4. From the slope of the line (Fig 5) of logarithm of time to attain a given displacement value versus reciprocal of absolute temperature an activation energy for inter-grain displacement for 600 to 800 °C and a stress of 4 kg/mm² of 36 k.cal/mol was calculated. Figs 6 and 7 show families of curves, for 400 and 800 °C, respectively, of total elongation and those due to slip within grains and at grain boundaries vs. time for various stresses. Fig 8 shows the difference between the total deformation and that accountable to these two effects related to total deformation as functions of time for 400 and 800 °C. The relation between displacement along grain boundaries and grain deformation for these two temperatures and various stresses is shown in

Card 2/3

SOV/180-59-2-9/34

Study of the Deformation of Nickel During Creep

Fig 9 to be linear. Figs 10 and 11 show photomicrographs of the nickel deformed under various conditions. The work showed that in the first stage of creep deformation of grains on account of visible slip lines takes place by way of increasing displacement along slip planes and multiplication of these planes; in the second stage multiplication of slip lines is the main factor. Deformation due to grain-boundary displacement occurs throughout the creep time and plays an increasing part at higher temperatures and lower stresses. Certain boundaries can, depending on conditions, either hinder or stimulate deformation in grains. In addition to displacement processes associated with slip lines visible under a microscope and with grain boundaries, displacement occurs through microscopically invisible slip lines and crack formation. There are 11 figures, 1 table and 16 references, 5 of which are Soviet and 11 English.

Card 3/3

SUBMITTED: December 6, 1958

ROZENBERG, V.M.

Connection between grain deformations and dislocations along boundaries during the creep of nickel. Issl.po zharopr.splav. 4:58-63 '59. (MIRA 13:5)
(Metal crystals) (Dislocations in crystals)
(Nickel--Metallography)

SOV/126- - -7-5-15/25

AUTHORS: Rozenberg, V. M. and Gradova, L. V.

TITLE: Changes in the Structure of Nickel and Solid Solutions of Titanium in Nickel During High Temperature Deformation (Izmeneniye struktury nikelya i tverdykh rastvorov titana v nikele pri vysokotemperaturnoy deformatsii)

PERIODICAL: Fizika metallov i metallovedeniye, Vol 7, Nr 5, pp 722-731 (+ 1 plate) (USSR) 1959

ABSTRACT: In this paper the nature of structural changes in nickel and solid solutions of titanium in nickel during deformation at high temperatures (700 and 900°C) were studied. The composition of the materials studied is shown in Table 1. In order to obtain uniform grain size of 0.2-0.3 mm the alloys were initially annealed at 1200°C (the alloy no. 134 for 1 hour, no.136 for 2 hours and no.137 for 3 hours). The load was selected so that fracture should occur after a few tens of hours. That deformation at which failure occurred after a few hours is called rapid, and that at which it occurred after a few tens of hours slow. The specimens were pulled in a vacuum apparatus. In Table 2 the conditions under which the specimens were pulled, and the essential test results, are shown. The nickel specimen no.134-1

Card 1/5

Changes in the Structure of Nickel and Solid Solutions of Titanium in Nickel During High Temperature Deformation

(the temperature for pulling was 700°C, stress 5.2 kg/cm^2) can be considered as an example which shows the changes in microstructure occurring under the action of stresses which lead to rapid fracture. In Figs.1 and 2 photomicrographs taken at various stages of straining of the specimens are shown. Fig.3 shows the structure in the vicinity of the fracture. The specimens were also studied by X-rays. In all cases a few sharp points are seen in the X-ray photograph taken of an undeformed specimen (see Fig.4). In Fig.5 a series of X-ray photographs is shown, taken of the same point of the specimen at various stages of expansion. A similar change in microstructure and X-ray picture obtained for specimen no.134-1 was also observed for specimen no.134-2 (pulling temperature 700°C, stress 3.5 kg/mm^2), no.136-2 (700°C, 8 kg/mm^2) and no.137-2 (700°C, 8 kg/mm^2). In the deformation under the influence of stress which leads to fracture after a few tens of hours, the change of microstructure differs from the above changes and is noticeably independent of the pulling temperatures used in the experiments.

Card 2/5

SOV/126- -- 7-5-15/25

Changes in the Structure of Nickel and Solid Solutions of Titanium in Nickel During High Temperature Deformation

As an example, the deformation of specimen no.137-5 (Ni + 6.3% Ti) at 900°C and stress of 2 kg/mm², is discussed. In Figs.6, 7 and 8 the microstructure of a specimen after a 4% deformation and fracture is shown. Sub-grains appear not only in grains in which intense slippage has occurred but also in those in which only barely noticeable signs of slip are evident. When the sub-grains are noticeable in the slip lines it can be seen that there is a definite connection between the direction of the slip lines and the sub-grains: the long side of the latter is perpendicular to the slip lines (see Figs.9, 10 and 11). In slow deformation the appearance of X-ray photographs taken of the specimens also changes. In Fig.12 portions of X-ray photographs taken of the specimen no.137-5 are shown. The changes in structure described for specimen no.137-5, tested at 900°C at a stress of 2 kg/mm² are also observed for nickel (900°C and 2 kg/mm²) and for nickel containing 3.6% Ti (900°C, 2 kg/mm²; 700°C, 4 kg/mm²). In Fig.13 a photomicrograph of the specimen no.135-7

Card 3/5

SOV/126- --7-5-15/25

Changes in the Structure of Nickel and Solid Solutions of Titanium in Nickel During High Temperature Deformation

(nickel + 3.6% Ti) after straining by 9.5% is shown. This specimen was deformed at 700°C at a stress of 3.9 kg/mm². At 700 and 900°C fracture of the specimen occurred along the grain boundaries at all stresses. As a result of the above investigations the authors have arrived at the following conclusions:

1. In the deformation of nickel and solid solutions of titanium in nickel at high temperatures, formation of slip planes, fragmentation of grains and displacement of grains relative to each other can be observed.

2. The fragmentation of grains in slow deformation at high temperatures does not appear to be the primary direct breaking down process of the original grain. It is associated with the preliminary non-uniform deformation of the latter, leading to local bending of the crystal. The observable fragmentation is a particular case of polygonization occurring under the simultaneous action of temperature and deformation. In the region 700-900°C the possibility of fragmentation is determined essentially by the rate of deformation.

Card 4/5

SOV/126-- -7-5-15/25

Changes in the Structure of Nickel and Solid Solutions of Titanium in Nickel During High Temperature Deformation

3. In the process of alloying nickel with titanium fragmentation of the grains occurs at lower deformation rates than in pure nickel.
4. The fracture of specimens tested at 700 and 900°C is intercrystalline in nature.

Card 5/5

There are 14 figures, 2 tables and 15 references, of which 4 are Soviet, 10 English and 1 Swiss

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Metallurgy and Physics of Metals TsNIIChM)

SUBMITTED: January 20, 1958

SOV/126-8-2-24/26

AUTHORS: Neymark, V.Ye. and Rozenberg, V.M.

TITLE: Influence of Boron on Recrystallization of Silicon Iron

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 8, Nr 2, pp 314 - 316 (USSR)

ABSTRACT: The authors have studied the influence of boron on the kinetics of the recrystallization of an iron-silicon alloy with 3% Si, 0.03% C, 0.2% Mn, 0.01% P and 0, 0.003, 0.005 or 0.01% B. X-ray methods were used to investigate the cold-rolled (60% reduction) metal. Figure 1 shows the relation between temperature and time for the start of recrystallization; the dependence of the data on boron concentration is shown in Figure 2. The activation energy rises continuously with increasing boron concentration. For the 0.01% B alloy the activation energy rises with decreasing temperature of the start of recrystallization; an effect similar to one observed by Rozenberg with E.Z. Kaminskiy (Ref 2) and the authors suggest that this should be studied further.

Card1/2

SOV/126-8-2-24/26

Influence of Boron on Recrystallization of Silicon Iron

There are 2 figures and 2 Soviet references.

SUBMITTED: October 16, 1958

Card 2/2

SOV/32-25-1-23/51

18(7)

AUTHOR: Rozenberg, V. M.

TITLE: Evaluation of the Contribution of Grain Boundaries in the General Deformation on Creeping (Otsenka vklada granits zeren v obshchuyu deformatsiyu pri polzuchesti)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 1, pp 53 - 57 (USSR)

ABSTRACT: Slow deformations taking place at high temperatures effect a grain displacement (with respect to one another). Temperature increase and decrease in stress usually bring about an increase in the relative deformation share with respect to the grain boundaries. The formation of a lattice (by abrasion) permits a quantitative evaluation of the deformation in connection with the grain boundaries (Ref 1). On the basis of a schematic representation of a microstructure with division lines (Fig 1) the deformation determination is explained and the respective calculations are given. It is stated that the method has a few deficiencies and is also inaccurate. To avoid these disadvantages the fact is made

Card 1/2

Evaluation of the Contribution of Grain Boundaries in the General Deformation on Creeping SOV/32-25-1-23/51

use of that the grains do not displace only lengthwise. A schematic representation shows (Fig 4) that the vector of displacement can be divided into three components. Two of them are on the plane of the sample surface and the third one is perpendicular with respect to the plane. The size of the vertical component can be measured by an interferometer according to Linnik (Ref 4), by the displacement of the interference waves at the grain boundaries. Vertical displacements of the magnitude of 0.03-0.05 μ can thus be determined without the formation of calibration lattices. Calculation examples, as well as a diagram of nickel creeping at 800° and of a stress of 2 kg/mm^2 (Fig 7) are given. A microscope of the MII-4 type was used. There are 7 figures and 8 references, 3 of which are Soviet.

ASSOCIATION: Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii (Central Scientific Research Institute of Ferrous Metallurgy)

Card 2/2

24(2) SOV/53-67-4-3/7

AUTHORS: Nadgornyy, E. M., Osip'yan, Yu. A., Perkas, M. D., Rozenberg, V. M.

TITLE: Thread-shaped Crystals With a Strength That Is Near Theoretical Strength (Nitevidnyye kristally s prochnost'yu, blizkoy k teoreticheskoy)

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 625-662 (USSR)

ABSTRACT: The present paper gives a survey of results obtained (especially by papers published in Westernperiodicals) concerning the properties and the growth of the so-called "whiskers", i.e. thread-shaped crystals, which, as regards order of magnitude, are 10^3 times as long as thick. The strength of these crystals surpasses that of ordinary crystals of the same substance by 10 to 100 times their amount and attains values that are near those calculated on the basis of the forces of interatomic interaction. Special interest is further caused by investigations of electric resistance (especially at low temperatures), of the domain structure of the ferromagnetic crystals, as well as of photoelectric and optical quantities. The present paper presents a clear survey of what

Card 1/3

has hitherto been achieved. Part I of the paper gives details (with numerous figures) concerning the formation,orientation, and shape of the whiskers; breeding by the regeneration of metals from their salts, and breeding by means of condensation from vapors, and other methods are dscribed, as also the production of nonmetallic whiskers; a number of photographs shows the shape and growth of copper- and tin-whiskers considerably enlarged (up to 9000 times). Part II contains a very vivid description of the growth of such crystals as well as data concerning a large number of papers, which are given in a table covering two pages. Part III deals with experiments and results concerning the mechanical properties of the whiskers; among other things, experimental data on the deformation of whiskers are compared with those of ordinary crystals; the tearing of these whiskers with as well as without previous plastic deformation is investigated and described in diagrams . The creeping of metallic whiskers is described (also the creeping resistance of whiskers is considerably greater than that of ordinary crystals of the same material). Finally, the influence exercised by temperature and by the dimensions of whiskers on their strength is described as also the influence

SOV/53-67-4-3/7

Thread-shaped Crystals With a Strength That Is Near Theoretical Strength

exercised by surface properties upon strength. Also the recovering of whiskers is demonstrated on the basis of figures 31 and 32 (altogether 10 photographs). Finally, other properties of whiskers are discussed in short (part IV). There are 33 figures, 5 tables, and 81 references, 6 of which are Soviet.

Card 3/3

18.7500
18.8200

68691

S/180/60/000/01/015/027
E193/E135

AUTHOR: Rozenberg, V.M. (Moscow)

TITLE: The Relationship between Grain-Boundary Slipping and Deformation within the Grains during Creep

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 1, pp 105-110 (USSR)

ABSTRACT: It is a well established fact that there is a close relationship between the grain-boundary slipping and deformation of grains during creep (Refs 1-3); the relationship is linear and holds for all stages of creep, i.e. it is not dependent on the rate of deformation. The linear character of this relationship indicates clearly that under certain given conditions, the process of creep in all its stages is determined by one mode of deformation. However, the question whether grain-boundary slipping or the deformation within the grains is paramount, remains still unanswered. MacLean and Farmer (Ref 1) who had investigated creep of an age-hardening copper-berrylium alloy, and Martin et al (Ref 4) who had studied creep of β-brass, inferred from their results that deformation within the grains is the governing process. In the

Card 1/8

68691

S/180/60/000/01/015/027
E193/E135

The Relationship between Grain-Boundary Slipping and Deformation within the Grains during Creep

opinion of the present author these conclusions are not justified and he considered that more useful information could be obtained by studying creep at a certain constant temperature and determining the part played by both grain-boundary slipping and grain deformation on a specimen in which it would be possible to vary the resistance of the grains to deformation without changing their size or chemical composition. It was decided that the 70Fe-30Ni alloy would be most suitable for this purpose. This alloy constitutes a γ solid solution with a phase-centered cubic crystal structure; on cooling below room temperature the alloy undergoes a γ to α transformation similar to the austenite to martensite transformation; on subsequent heating above 550 °C, an α to γ transformation, also martensitic in character, takes place. It has been shown by several workers (Refs 5-7) that the $\gamma \rightarrow \alpha \rightarrow \gamma$ transformation brings about fragmentation of the solid solution grains into a large number of small regions, which is accompanied by distortion of the

Card 2/8

68691

S/180/60/000/01/015/027
E193/E135

The Relationship between Grain-Boundary Slipping and Deformation within the Grains during Creep

crystal lattice at the boundaries of these regions: the metal in this condition is thus characterized by the presence of a large number of demarcation planes (sub-boundaries) in the grains which have retained their original size. It has been shown, also, that the resistance to creep (at 770 °C) of specimens that have undergone the $\gamma \rightarrow \alpha \rightarrow \gamma$ transformation is lower than that of untransformed alloy. Since raising the temperature of the preliminary annealing from 800 to 1100 °C reduces the difference between the resistance to creep of transformed and untransformed specimens, and since this effect is obviously associated with the number of lattice defects due to the $\gamma \rightarrow \alpha \rightarrow \gamma$ transformation being reduced by a high-temperature anneal, it was concluded that comparison of the total elongation in creep with the elongation due to grain-boundary slipping, measured on transformed and untransformed material, would make it possible to determine the effect of the grain structure on the behaviour of the grain boundaries in creep. To make sure

Card 3/8

68691
S/180/60/000/01/015/027
E193/E135

The Relationship between Grain-Boundary Slipping and Deformation within the Grains during Creep

that any of the observed effects were not caused by changes in the grain boundaties themselves, it was decided to carry out an additional series of tests on single crystal specimens. The composition of the experimental alloy (prepared by vacuum melting technique) was: 30% Ni, 0.4% Ti, 0.15% Mn, remainder Fe. Single crystals were prepared by the pulling-up technique, the polycrystalline specimens by the normal, mechanical treatment methods. The single crystal test pieces were cut from one single crystal by means of spark-machining, care being taken to ensure that the orientation of both test pieces in respect to the axis of load was the same: the dimension of the gauge length of these test pieces was 2 x 1 x 10 mm. The dimensions of the gauge length of the polycrystalline test pieces were 3 x 2 x 25 mm. All the test pieces were polished, first mechanically, and then electrolytically in a 95% acetic anhydride plus 5% hydrochloric acid mixture. All test pieces were annealed at 1350 °C for 2 hours and cooled in the furnace to room

Card 4/8

68691
S/180/60/000/01/015/027
E193/E135

temperature (first type of heat treatment); part of the annealed test pieces was cooled in liquid nitrogen ($\gamma \rightarrow \alpha$ transformation) and then heated to 750 °C, held at that temperature for 6 hours ($\alpha \rightarrow \gamma$ transformation) and cooled, in vacuum, to room temperature (second type of heat treatment). The creep tests were conducted in vacuum (10^{-3} mm Hg) at 700 °C under the stress of 2.5 kg/mm^2; periodically the tests were interrupted to measure the total deformation and (in the case of the polycrystalline specimens) the deformation due to the grain-boundary movement. The creep curves for the single crystal specimens are reproduced in Fig 1, where curves a and b relate to specimens subjected to the preliminary heat treatment of the first and second types, respectively. It will be seen that the annealed crystal deformed at a much slower rate than the specimen which had undergone the $\gamma \rightarrow \alpha \rightarrow \gamma$ transformation. This indicates that shortening of the time-to-rupture and increased rate of creep of austenite after martensitic transformation,

68691

S/180/60/000/01/015/027
E193/E135

The Relationship between Grain-Boundary Slipping and Deformation within the Grains during Creep

The creep curves ($\frac{e_o - e_{rp}}{e_o}$ 100% versus τ, h) for
polycrystalline specimens, subjected to the preliminary
heat treatment of the first and second type, are
reproduced in Fig 2 (curves a and b, respectively); the
$\overline{p}$ (microns) versus τ(h) curves for the same specimens
are reproduced in Fig 3. Here again, the rate of creep of
the annealed specimens was slower than that of the
specimens that had undergone the $\gamma \rightarrow \alpha \rightarrow \gamma$ trans-
formation. Since metallographic examination has failed to
reveal any intergranular cracks, it follows that the
deformation within the grain, e_{ck}, is given by
$e_{ck} = e_o - e_{rp}$; the $\overline{p}$ (microns) versus e_{ck} relation-
ship is illustrated by the graphs in Fig 4. Thus, the
following facts have been established: (1) the resistance
to creep of a solid solution that has undergone the
$\gamma \rightarrow \alpha \rightarrow \gamma$ transformation is lower than that of the same
solution in the annealed condition; (2) since this
Card decrease in the resistance to creep has been observed also
7/8 in single crystals, it can be assumed that it is mainly

68488

18.8200

S/126/60/009/01/023/031
E111/E191

AUTHORS: Rozenberg, V.M., and Epshteyn, I.A.

TITLE: A Study of Grain-Boundary Displacement in Creep

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 1, pp 124-132 (USSR)

ABSTRACT: The authors report their investigation of grain boundary displacement due to enlargement of some grains at the expense of others during creep of aluminium. Figs 1 and 2 show the displacement, also called boundary migration. The object was the elucidation of the role of this effect in creep and the influence of the boundary location with respect to the extension axis and of the mutual orientation of neighbouring grains on the extent of displacement. Aluminium (99.99%) with traces of Mg, Si and Cu was used, the working part of a specimen being 4 x 5 x 50 mm. Annealing for 1 hour at 400 °C gave a mean grain diameter of 0.2 mm, unaffected by prolonged heating at 275-325 °C. Specimens with ground and electrolytically polished surfaces were tested at a constant load, giving an initial stress of 0.4 kg/mm^2. Specimens were removed from the machine at a certain

Card 1/3

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001445610013-6"

68486

S/126/60/009/01/023/031
E111/E191

A Study of Grain-Boundary Displacement in Creep

stage of creep and the extent of migration of 100 boundaries was measured microscopically (differentiation from movement of one grain relative to another being effected as shown schematically in Fig 3). Creep curves obtained at 275, 300 and 325 °C are shown in Fig 4, the corresponding values of average displacement being given in Fig 5. Fig 6 shows these values plotted against deformation, while Fig 7 gives relations between the logarithms of the time to obtain displacements of 3, 2 and 1.5 microns and the reciprocal of absolute temperature. These relations are linear, indicating an activation-energy of 18 kcal/mol. Use of this value in the appropriate equation enables the curves of Fig 5 relating to three different temperatures to be represented by a single curve (Fig 8). Agreement with the data of Harper, Shepard and Dorn (Ref 3) is shown by the results in Fig 9, where the value of the displacement along a boundary (i.e. grain movements relative to each other) is plotted against the angle between the specimen axis and the trace of the boundary on the surface; for 300 °C and a

Card 2/3

68468

S/126/60/009/01/023/031
E111/E191

A Study of Grain-Boundary Displacement in Creep

deformation of 6% a maximum occurs at 45 °C, and the lowest values occur at 0 and 90°. Fig 10 shows the absence of correlation between this angle and the boundary migration. The authors note that it is still uncertain whether the boundary is displaced from a grain of higher to one of lower elastic energy or vice versa and recommend investigation of this point. The displacement certainly leads to a reduction in total elastic energy of neighbouring grains and of the material as a whole and plasticity increases.

Card 3/3

There are 10 figures, 2 tables and 9 references, of which 3 are Soviet, 3 English, 2 French and 1 from Acta Metallurgica.

ASSOCIATION: Institut metallofiziki TsNIIChM (Metal-Physics (Institute of TsNIIChM)

SUBMITTED: September 8, 1959

80890

S/126/60/009/06/018/025
E073/E335

18.7500

AUTHOR: Rozenberg, V.M.

TITLE: Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 6, pp 922 - 926 (USSR)

ABSTRACT: It was established earlier that depending on the test conditions phase work-hardening may lead to an increase or to a decrease in the strength. Specimens subjected to phase work-hardening as a result of loading over long periods at elevated temperatures (700 °C) have a lower strength than specimens which were not subjected to phase work-hardening. This difference is due to structural transformations leading to a change in the grain properties but it can also be due to a change in the mechanism of deformation, which depends on the initial structure of the material. To verify the latter, it is advisable to investigate microscopically the picture occuring in the case of creep of solid-solution specimens. To eliminate the influence of grain boundaries such investigations are best carried out on single crystals. In the experiments

Card1/4

80890

S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

described in this paper, an alloy containing 30% Ni, 0.4% Ti, 0.15% Mn, rest Fe was used. An alloy of this composition represents a solid solution with a face-centred cubic lattice. On cooling the γ-solid solution below room temperature a martensitic γ→α transformation takes place. Heating of the transformed α-solid solution above 500 °C leads to a reverse, α→γ transformation, which is also of the martensitic type. The γ→α→γ transformation brings about a fragmentation of the γ-phase crystals into numerous small areas, disrupting the regular structure at the boundaries of these areas. Such changes in the intracrystalline structure lead to property changes. Two specimens, 2 x 1 x 10 mm, were produced by electro-erosion cutting of a single crystal; orientation of both relative to the tensile-stress axis was equal. According to analysis, sliding in these crystals should proceed in the plane (̄111) in the direction [̄1̄10]. Both specimens were annealed at 1 350 °C for two hours and cooled to room temperature in the furnace. Then one of the specimens

Card2/4

80890

S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

was cooled in liquid nitrogen and subsequently heated (in vacuum) to 750 °C and held at that temperature for six hours, thus transforming it into the γ-phase. The specimens were tested at 700 °C with a tensile load of 2.5 kg/mm^2 in vacuum. After some stretching, the specimen was relieved of the load, cooled and removed from the vacuum chamber. The total elongation was measured and the surface was subjected to metallographic investigation. After fracture, the relief occurring at the surface of the specimens was studied by means of an interference microscope and the change in the orientation of the crystals relative to the tensile-stress axis was determined by X-ray diffraction. The obtained data lead to the conclusion that the difference in the behaviour of an annealed specimen and a specimen which was subjected to phase work-hardening is not due to qualitative changes in the deformation mechanism. Due to the presence of lattice defects in the transformed specimen the process of sliding will be more intensive in it than in annealed specimens.

Card3/4

80890
S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

There are 5 figures and 6 Soviet references.

ASSOCIATION: Institut metallofiziki TsNIIChM
(Institute of Metal Physics, TsNIIChM)

SUBMITTED: December 3, 1959

Card 4/4

Rozenberg, V.M.

82641

S/126/60/010/02/011/020
E021/E335

18.7500

AUTHORS: Gorelik, S.S., Kal'yanova, S.M. and Rozenberg, V.M.

TITLE: Structural Changes in Aluminium With Slight Deformation and a Subsequent Annealing

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol. 10, No. 2, pp. 251 - 261

TEXT: AV-000 aluminium containing traces of magnesium, silicon and copper was used in the investigation. Deformation was produced on a 5-ton press at 21 mm/min. The number of slip marks, the vertical component of displacement in the slip marks and the vertical component of displacement of grains relative to one another were measured on an interference microscope by the method described in earlier work (Ref. 3). The mean grain size was also found. Migration of the grain boundaries during recrystallisation was found by a method using polarised light (Ref. 5). The critical degree of deformation using an annealing temperature of 400 °C was found by constructing a graph of grain size after annealing against degree of deformation. It was found to be approximately 6.5%. Fig. 2 shows the influence of small degrees of deformation on the number of slip marks, the mean dis-

Card 1/3

82641

S/126/60/010/02/011/020
E021/E335

Structural Changes in Aluminium With Slight Deformation and a Subsequent Annealing

placement in the slip marks, the mean displacement between the grains and the ratio of the last two, in descending order. This shows that the basic mechanism of plastic flow, with or without the critical degree of deformation, is the same - slip in the grains accompanied by displacement of the grains relative to one another. After deformation less than the critical value, structural changes during annealing occur, in the main, by polygonisation, with a small degree of migration of boundaries of individual grains, stimulated by the tendency to decrease the surface energy of a system (Figs. 3, 4). Very occasionally, migration of the boundary occurs because of differences in volume energy of adjacent grains (Fig. 5). After deformation greater than the critical amount, annealing at 400 °C is accompanied by intensive growth of individual crystallites and frontal migration of boundaries which is stimulated by differences in volume elastic energy of adjacent grains. The rate and distance of migration of boundaries is many times greater than that stimulated by surface energy differences. Intensive growth occurs after an

Card 2/3

82641

S/126/60/010/02/011/020
E021/E335

Structural Changes in Aluminium With Slight Deformation and a Subsequent Annealing

incubation period during which redistribution of the energy inside the grains occurs (Figs. 6-8). After deformation many times greater than the critical amount, new grains arise between the original grains at places of maximum distortion. The orientation of the new grains differs sharply from those surrounding it. This occurs after an incubation period of 6 to 30 minutes. There are 8 figures, 1 table and 7 references: 6 Soviet and 1 English.

ASSOCIATION: TsNIIChM

SUBMITTED: March 19, 1960

Card 3/3

LEVIN, B.I.; ROZENBERG, V.M.; YAKOVLEV, P.A.; KORF, Z.G.; KULYGIN, B.A.; PETROV, G.I.

Unification of structures of sea and river mooring installations. Transp. stroi. 15 no.9:39-42 S '65. (MIRA 18:11)

1. Gosudarstvennyy proizvodstvennyy komitet po transportnomu stroitel'stvu SSSR (for Levin). 2. Gosudarstvennyy institut proyektirovaniya i izyskaniya na rechnom transporte (for Yakovlev, Korf). 3. Gosudarstvennyy proyektno-konstruktorskiy i nauchno-issledovatel'skiy institut morskogo transporta (for Kulygin, Petrov).

ACC NR: AR6017264 SOURCE CODE: UR/0058/65/000/012/E070/E070

43
B

AUTHOR: Rozenberg, V. M.

TITLE: Fine slipping during creep

SOURCE: Ref. zh. Fizika, Abs. 12E537

REF SOURCE: Sb. tr. In-t metalloved. i fiz. metallov Tsentr. n.-i. in-ta chernoy metallurgii, vyp. 36, 1964, 67-76

TOPIC TAGS: creep mechanism, crystal deformation, nickel, physical diffusion

ABSTRACT: The nature of the total-deformation fraction ($\dot{\epsilon}_x$) whose tracks cannot be observed on the sample surface by ordinary optical microscopy was investigated in single and polycrystals of Ni. It is established that $\dot{\epsilon}_x$ varies with the temperature and stress in the same manner as the part of the deformation due to the coarse slip tracks. $\dot{\epsilon}_x$ is 4 - 8 orders of magnitude larger than the rate of deformation estimated on the basis of the theory of diffusion creep. These, and also some other data given in the article, give grounds for assuming that the deformation whose tracks cannot be observed by metallographic methods, is the result of fine slip. V. Rozenberg. [Translation of abstract]

SUB CODE: 20

Card 1/1

INDENBOM, V.L.; MOGILEVSKIY, M.A.; ORLOV, A.N.; ROZENBERG, V.M.

Physical nature of the creep of crystalline bodies (review). FMiM no.1:160-167 Ja-F '65. (MIRA 18:8)

ROZENBERG, V.M.

Fine structure slip during creep. Probl. metalloved. i fiz. met. no.8: 67-76 '64. (MIRA 18:7)

L 45217-65 EWP(z)/EWA(c)/EWT(m)/EWP(b)/T/EWA(d)/EWP(t)/EWP(w) Pad IJP(c)
ACCESSION NR: AT5011204 JD/HW UR/2717/64/000/008/0067/0076

AUTHOR: Rozenberg, V. M.

TITLE: Fine slip during creep

SOURCE: Dnepropetrovsk. Institut metallovedeniya i fiziki metallov. Problemy metallovedeniya i fiziki metallov, no. 8, 1964, 67-76

TOPIC TAGS: metal slip, metal creep, metal deformation, nickel, metal grain structure, metal diffusion

ABSTRACT: Total deformation during creep is made up not only of deformation due to coarse creep (ε_{cr}) but also of deformation connected with step-like phenomena along the grain boundaries (ε_{gr}); that is, $\varepsilon_{cr} + \varepsilon_{gr} < \varepsilon_{tot}$. A considerable part of the total deformation is not evident under an optical microscope. We designate this part as ε_x. From electron microscope determinations the height of the fine creep traces is 50-200 Å. They have also been observed with a phase-contrast microscope. The dependence of ε_{tot}, ε_{cr}, and ε_x on temperature and stress has been measured for nickel at a temperature of approximately 700°C. Experimental data from the

Card 1/2

L 45217-65

ACCESSION NR: AT5011204

literature indicate that ε_x varies as a function of temperature and stress in the same way as deformation due to coarse slip. The dependence of ε_x on time can be divided into two stages: an unsteady state stage with a diminishing rate and a steady state stage with a constant rate. Comparison of experimental values of ε_x with values of ε_{diff} estimated from the theory of diffusion creep shows that they differ by 4-8 orders of magnitude. The substructure created in grains of polycrystalline nickel by the creep under study leads to a decrease in the component ε_x, to a decline in its rate, and to an increased rate of diffusion of Fe^{59} into nickel. It is confirmed that deformation not observable by metallographic methods is the result of fine creep. At temperatures up to 0.4-0.7 from the melting temperature and rates of 10^{-6}-10^{-8} sec^{-1}, deformation due to individual transfer of atoms either does not occur or occurs only to an inconsiderable degree. Orig. art. has: 12 figures and 3 tables.

ASSOCIATION: None.

SUBMITTED: 00 ENCL: 00 SUB CODE: MM

NR REF SOV: 005 OTHER: 006

Card 2/2

ROZENBERG, V.M., inzh.

Unification of structures for marine construction, Transp. stroi. 13 no.10:22-25 O '63. (MIRA 17:8)

KUGAYENKO, O.N.; ROZENBERG, V.M.; SHALIMOVA, A.V.

Effect of initial substructure on creep and its changes during creep. Fiz.met.i metalloved. 15 no.4:612-615 Ap '63.
(MIRA 16:6)

1. Institut metallofiziki TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Iron-silicon alloys--Metallography) (Creep of metals)

ROZENBERG, V.M.

Studying creep in single nickel crystals. Fiz. met. i metalloved. 14 no.1:114-120 Jl '62. (MIRA 15:7)

1. Institut metallovedeniya i fiziki metallov TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Creep of nickel)

ROZENBERG, V.M., kand.tekhn.nauk

Deformations at the expense of grain boundaries during metal creep. Probl.metalloved.i fiz.met. no.7:93-116 '62. (MIRA 15:5)
(Creep of metals)

ROZENBERG, V.M.

Characteristics of the part of deformation in nickel creep not revealed by microscopy. Fiz. met. i metalloved. 13 no.6: 894-900 Je '62. (MIRA 15:7)

1. Institut metallovedeniya i fiziki metallov TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Creep of nickel)
(Nickel—Metallography)

ROZENBERG, V.M.; LADYCHENKO, K.D.

Technical specifications for carrying out and inspecting the erection of harbor structures. Transp. stroi. 12 no.2:48-50 F '62. (MIRA 15:7)

1. Glavnyy inzh. Glavnogo upravleniya po stroitel'stvu morskikh i rechnykh sooruzheniy Ministerstva transportnogo stroitel'stva SSSR (for Rozenberg). 2. Rukovoditel' laboratorii Vsesoyuznogo nauchno-issledovatel'skogo instituta transportnogo stroitel'stva Ministerstva transportnogo stroitel'stva (for Ladychenko).
(Hydraulic structures) (Precast concrete construction)

S/776/62/000/024/002/007
E111/E135

AUTHORS: Vinograd, M.I., Rozenberg, V.M., and Shapiro, M.M.

TITLE: Modern methods for phase analysis of steel and alloys

SOURCE: Moscow. Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii. Sbornik trudov. no.24, 1962. Novyye metody ispytaniy metallov. 191-203.

TEXT: Phase analysis is important in developing new materials with special properties and in improving existing materials. The authors outline the characteristics of four main groups of methods available: metallographic, X-ray, chemical and electrochemical, physical. As examples of their application to the solution of currently important problems the authors discuss the following: low strength of weld in tubes of type 1Х18Н9Б (1Kh18N9B) steel; formation of sigma-phase in high-silicon steels and alloys, leading to loss of ductility; low plasticity in tensile tests on some heats of type Х25 (Kh25) steel; excessive inclusion content in type 0Х18Н9Т (0Kh18N9T) steel; estimation of inclusion content in high-purity steels, e.g. type ШХ15 (ShKh15); failure of steel in hot mechanical deformation.

Card 1/2

Modern methods for phase analysis... S/776/62/000/024/001/007
E111/E135

In addition, outside the U.S.S.R. electron microscopic investigation of grain boundaries as well as local X-ray spectrum analysis are widely used. Because methods are so numerous and complicated, teams of experts working together are needed. There are 7 figures and 4 tables.

Card 2/2

18.8200

39754
S/126/62/014/001/010/018
E193/E383

AUTHOR: Rozenberg, V.M.

TITLE: A study of creep of nickel single crystals

PERIODICAL: Fizika metallov i metallovedeniye, v. 14, no. 1, 1962, 114 - 120

TEXT: The main shortcoming of creep tests carried out on polycrystalline specimens is that the results may be affected to various degrees by the presence of grain boundaries and, consequently, may not be easy to interpret in terms of basic laws governing the phenomenon of creep. This prompted the authors to undertake the investigation described in the present paper. To ensure the same orientation and degree of purity in all the test pieces, they were cut from one Ni single crystal, prepared by the conventional pulling-out technique. The creep tests were carried out in vacuum at 670 - 770 °C under a stress varying from 350 - 1 190 g/mm^2. It was found that under the conditions employed the rate of steady creep $\dot{\varepsilon}_{уст}$ is described by:

Card 1/4

S/126/62/014/001/010/018
E193/E383

A study of creep of ....

$\dot{\varepsilon}_{уст} = A\tau^{n} \exp(-67\,000/RT)$ where τ is the applied stress, T temperature and $n = 4.4$. This relationship was found to be in good agreement with that based on Weertman's theory of climb of dislocations, which means that diffusion-controlled relaxation is the slowest of the processes determining the rate of steady creep. Using the Weertman equation and experimental data obtained in the course of the present investigation, the author derived formulae for the density of sources on dislocations M at a constant temperature:

$$M = 2 \times 10^{-76} \frac{\tau^{9}}{\dot{\varepsilon}^{2}_{уст}}, \ \mathrm{cm}^{-3} \qquad (5)$$

and at a constant stress:

$$M = 3 \times 10^{35} \left[\frac{\exp(-38\,000/T)}{T\dot{\varepsilon}_{уст}} \right]^{2} \qquad (6)$$

Card 2/4

S/126/62/014/001/010/018
E193/E383

A study of creep ....

The values of M were $10^9 - 10^{10}$ cm^{-3} for the temperature- and stress ranges studied. These values were in good agreement with those calculated from data on the size of subgrains and the degree of their misalignment, which confirmed the validity of the equation derived by the present author. Data on creep of single crystals were correlated, in the final stage of the investigation, with those obtained by Weertman and Shahinian (Trans. AIME, 1956, 206, 1223) on polycrystalline specimens. The results are reproduced in Fig. 6, where $(\dot{\varepsilon}\ T \exp Q/kT)/LL'$, $^{\circ}C/min.cm^2$ is plotted against stress ($dyne/cm^2$); here, L and L' denote, respectively, the size of grains and subgrains, the triangles and squares relating to creep of polycrystalline specimens at temperatures indicated in the insert, the circles relating to creep of single crystals at 670 - 730 °C. It will be seen that this relationship is similar for both single-crystal and polycrystalline material, which indicates that the presence of grain boundaries does not give rise to the appearance of a separate mechanism of deformation, making a substantial contribution to the total deformation in creep.
There are 6 figures.
Card 3/4

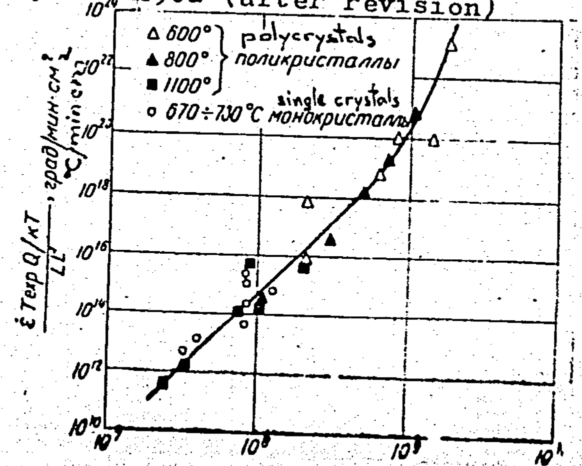
A study of creep ....

S/126/62/014/001/010/018
E193/E383

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Metal Science and Physics of Metals, TsNIIChM)

SUBMITTED: October 31, 1961 (initially)
January 24, 1962 (after revision)

Fig. 6:



Card 4/4

ROZENBERG, V.M.

Determining elongation value related to slip traces. Zav.lab. 28 no.2:219-222 '62. (MIRA 15:3)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii imeni I.P.Bardina.
(Dislocations in metals)

S/126/62/013/006/009/018
E021/E192

AUTHOR: Rozenberg, V.M.

TITLE: The nature of the part of deformation not detected in microstructure during the creep of nickel

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.6, 1962, 894-900

TEXT: Experiments were carried out on nickel single crystals in order to show how much deformation was caused by visible slip lines and how much deformation was not connected with observable structural changes. Specimens (2 x 3 x 10 mm) were cut from a single crystal of nickel (99.95%) with the strain axis and the observed surface disaligned by not more than 2-3°. They were heated in vacuo at 1150 °C for 6 hours and electrolytically polished prior to test. Testing was carried out in vacuo at 670-770 °C with shearing stresses of 450 to 1190 g/mm^2. Occasionally the specimens were unloaded, cooled, and after removing from the apparatus, the elongation, number of slip lines on the gauge length and height of slip lines were measured. The total elongation was measured on a microscope and the remaining

Card 1/2

The nature of the part of deformation... S/126/62/013/006/009/018
E021/E192

measurements were carried out by an interference microscope. It was established that not all the deformation is localised in the slip lines visible under the microscope. The deformation not visible under the microscope (ε_x) is obtained by subtracting the deformation due to observed slip lines ($\varepsilon_{s\ell}$) from the total deformation. In the investigated ranges of stress and temperature ε_x is greater than $\varepsilon_{s\ell}$. Both ε_x and $\varepsilon_{s\ell}$ when plotted against time show a period of decreasing rate of creep and then a region of steady-state creep. For ε_x, $\varepsilon_{s\ell}$ and ε_{total}, the rate of change of deformation with time is proportional to time to the power of 4.4. The possible rate of creep due to diffusion mechanism can be found, knowing the coefficient of diffusion for nickel. It is lower than the experimental values observed for ε_x by a factor of 8-9. Thus, ε_x is caused by crystallographic slip and not by a diffusion mechanism. There are 10 figures and 2 tables.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Science of Metals and Physics of Metals, TsNIIChM)

SUBMITTED: September 20, 1961

Card 2/2

VOLOSHINA, L.A.; ROZENBERG, V.M.

Investigating the creep of aluminum bicrystals. Fiz. met. i metalloved. 12 no.1:118-124 J[redacted]61. (MIRA 14:8)

1. Institut metallovedeniya i fiziki metallov TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Aluminum crystals) (Creep of aluminum)

18.9500

36605
S/126/62/013/003/023/023
E021/E180

AUTHORS: Voloshina, L.A., and Rozenberg, V.M.

TITLE: Influence of the orientation of aluminium single crystals on creep

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.3, 1962, 474-476

TEXT: Single crystals of 99.99% aluminium were prepared by selective recrystallization. The gauge length of the specimen was 25 mm and its diameter 6 mm. With a stress of 1164 g/mm^2 at 20 °C, a sample in which a large number of slip systems could operate deformed much less than a sample in which the probability of slip was extremely small except in the main system. After ten hours the crystals deformed to 3.2 and 22.5% respectively. At 300 °C, with a stress of 124 g/mm^2, the behaviour was reversed. The results confirmed that a large number of slip systems results in strengthening at low temperatures and an increase in deformation at higher temperatures. It had been shown (Ref.6: D. MacLean, Grain Boundaries in Metals (Granitsy zeren v metallakh), Metallurgizdat, 1960) that slip in grain boundary
Card 1/2

regions of polycrystalline samples was complex. In these regions, in the case of a face-centred cubic lattice, up to five families of slip can operate. Thus, at low temperatures, this would result in strengthening, and at higher temperatures in an increase in deformation. In this way, the effect of grain size on creep resistance could be explained without the idea of the "viscous behaviour" of the boundary.

There are 3 figures.

ASSOCIATION: Institut metallofiziki TsNIIChM
(Institute of Physics of Metals, TsNIIChM)

SUBMITTED: July 17, 1961

VOLOSHINA, L.A.; ROZENBERG, V.M.; FINKEL'SHTEYN, I.B.

Connection between boundary migration and deformations in boundary zones during metal creep. Fiz. met. i metalloved. 12 no.2:265-268 Ag '61. (MIRA 14:9)

1. Institut metallovedeniya i fiziki metallov TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Crystal lattices) (Creep of metals)

S/032/62/028/002/024/037
B124/B101

AUTHOR: Rozenberg, V. M.

TITLE: Evaluation of the values of elongation due to slide tracks

PERIODICAL: Zavodskaya laboratoriya, v. 28, no. 2, 1962, 219-222

TEXT: Values of elongation due to the displacement of a material in one track and the number of tracks per unit length of sample yield sufficient data for the calculation of elongation due to all tracks in polycrystalline materials and single crystals. The mean displacement of polycrystalline materials in one track can be determined by measuring the height of the tracks with the interference microscope МИИ-4 (MII-4). The mean elongation $\bar{p}$ due to one track is $\bar{p} = 2.3\,\bar{h}\sqrt{1 + \varepsilon_{total}}$, where ε_{total} is the elongation of the whole sample. Hence, the deformation due to all slide tracks is given by $\varepsilon_{st} = \frac{\bar{p}n}{\sqrt{2}}\,100\%$, where n is the number of slide tracks per unit length of the initial sample. The schematic diagram shown

Card 1/4

in Fig. 2 is used to evaluate ε_{st}, with X,Y, and Z being a system of orthogonal coordinates related to the sample. The elongation is given by $\Delta l = \frac{\sqrt{h_1^2+h_2^2}}{\tan\lambda}$ (5), and, for small values of λ, $h_2 = \Delta l \tan\beta$. Hence, $\Delta l = h_1/\sqrt{(\tan^2\lambda - \tan^2\beta}$ (7). With the optical microscope, however, the total height of the slide track H=nh is measured, the corresponding elongation being $\Delta L = n\Delta l$, for which $\Delta L = \frac{\sqrt{H_1^2 + H_2^2}}{\tan\lambda}$, and $\Delta L = H_1/(\sqrt{\tan^2\lambda - \tan^2\beta})$, respectively. λ is measured by an X-ray method. The angle β and its change with deformation were determined using stereographic projection (Fig. 3). The values of ΔL due to one slide track were calculated from Eqs. (5) and (7) for slide on two faces of a nickel single crystal perpendicular to each other. The accuracy of H measurement is examined on a single crystal of nickel after 9.1% deformation. H_1 was found to be 0.113μ which agrees fairly well with results calculated from Eqs. (5) and (7). The method

Card 2/4 3

described can be used for coarse-grained materials, with the orientation of the individual grains being determined from X-ray data and etch patterns, respectively. There are 5 figures, 1 table, and 5 references: 4 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: R. Maddin, E. Harrison, R. Gelinas, Acta Met., no. 4, 1 (1953).

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

Fig. 2. Schematic diagram of step formation due to displacement along the slip plane (p is the displacement vector; h_1, h_2, and Δl are components of the displacement vector).

Fig. 3. Stereographic projection illustrating the method used to determine the angle β. Legend: (A) plane of observation; (B) normal to the sample surface; (C) direction of slip; (D) axis of elongation; (E) slip plane.

ROZENBERG, V.M.

Evaluating the magnitude and disorientation of subgrains occurring during creep on the surface and inside of specimens. Fiz. met. i metalloved. 9 no. 4:621-625 Ap '60. (MIRA 14:5)

1. Institut metallofiziki TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Creep of metals) (Aluminum crystals)

ROZENBERG, V.M.

Effect of substructure on the creep of nickel. Fiz. met. i metalloved. 11 no.6:899-909 Je '61. (MIRA 14:6)

1. Institut metallovedeniya i fiziki metallov TSentral'nogo nauchno-issledovatel'skogo instituta chernoy metallurgii.
(Nickel--Metallography)
(Creep of nickel)

SMIRNOV-ALYAYEV, Georgiy Aleksandrovich, prof., doktor tekhn. nauk; GASTEV, V.A., prof., doktor tekhn. nauk, retsenzent; ROZENBERG, V.M., kand. tekhn. nauk, red.; VASIL'YEVA, V.P., red.izd-va; SPERANSKAYA, O.V., tekhn. red.

[Resistance of materials to plastic deformations; engineering methods for designing press-working operations] Soprotivlenie materialov plasticheskomu deformirovaniiu; inzhenernye metody rascheta operatsii plasticheskoi obrabotki materialov. Izd.2., perer. i dop. Moskva, Mashgiz, 1961. 461 p. (MIRA 14:12)

(Deformations(Mechanics)) (Plasticity) (Sheet-metal work)

18 8200 2808 25922 S/126/61/012/001/014/020
E193/E480

AUTHORS: Voloshina, L.A. and Rozenberg, V.M.

TITLE: Investigation into the creep of aluminium bi-crystals

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.1, pp.118-124

TEXT: The generally accepted view that the relative movement of crystals plays an important part in deformation during creep is based partly on the fact that grains stand up in relief on a preliminarily polished surface of a specimen tested in creep. However, it can be postulated that this effect is caused not by crystal boundary sliding but by the fact that the adjacent crystals are deformed in a different manner. The most convenient way of checking this theory is to conduct creep tests on specimens on which the behaviour of any given grain boundary can be easily studied, bi-crystal specimens being most suitable for this purpose. The effect of temperature, applied stress and degree of misorientation between grains on the rate of creep and degree of deformation of bi-crystals has been studied by several workers. The object of the present investigation was to measure the elongation of various parts

Card 1/7

of an aluminium bi-crystal test piece with a particular reference to the grain-boundary regions and to study the microstructure of these regions. The bi-crystal specimens were prepared from AB000 (AV000) grade aluminium by the usual method of annealing the lightly deformed metal. The creep test pieces (with the parallel portion measuring 25 x 5 x 3 mm) were cut from the blanks in such a way that the bi-crystal boundary was inclined at 45° to the test piece axis. The test pieces were annealed at 600°C and electrolytically polished, after which a set of thin scratches was inscribed with an aluminium alloy scriber on the polished surface. All creep tests were carried out at 300°C under an initial stress of 0.2 kg/mm^2. Each test was periodically interrupted and, after cooling the test piece to room temperature, the total elongation of the gauge length, the elongation of each crystal and the displacement of the scratches intersecting the grain-boundary were measured. Metallographic and X-ray diffraction analyses of the specimens were also carried out. Typical results are reproduced in Fig.1, where the relative elongation (%) is plotted against time (hours); this graph was constructed for a test piece whose stereographic projection is illustrated in Fig.2, where continuous and broken lines relate to the first and second crystals respectively; the plane of projection corresponds to the specimen surface, the point in the centre of the projection representing normal to the specimen surface; the arrow indicates the direction of applied stress. The gauge length of the specimen was divided into 5 parts in the way shown in the insert in Fig.1. Curve 1 in Fig.1 relates to the entire gauge length (i.e. to the part of the test piece bounded by points 1 to 6) while curves 2, 3, 4, 5 and 6 relate to parts bounded by points 1-2, 2-3, 3-4, 4-5 and 5-6 respectively. It will be seen that the rate of creep varied considerably from one part of the test piece to another. It is particularly significant that the rate of creep of the part containing the grain-boundary, i.e. the part bounded by points 3-4 (curve 4), was slower than that of the adjacent parts, bounded by points 2-3 and 4-5 (curves 3 and 5 respectively). Owing to the difference in the orientation, the rate of creep of any part belonging to the crystal bounded by points 1-3 was slower than the rate of creep of any part of the crystal bounded by points 4-6. The results of other measurements are best summarized by referring to Fig.3, which shows diagrammatically the bi-crystal (a) before and (b) after deformation; the symbol ℓ in Fig.3B denotes the grain-boundary displacement and $x = l \cos \alpha$ is the component of ℓ resolved in the direction of applied stress. It will be seen from Fig.4, where $x(\mu)$ is plotted against the strain $\Delta\varepsilon_{3-4}(\mu)$ of the part of the test piece bounded by points 3-4, that x is by one order of magnitude smaller than $\Delta\varepsilon_{3-4}$ and that there is a definite (linear) relationship between these two parameters. By the process of elimination of the possible explanations of these facts, the present authors showed that the observed displacement of the grains is a result of the deformation of the grains in the grain-boundary region and not vice versa. This conclusion was supported by the results of the next series of measurements, whose results are reproduced in Fig.6, where the vertical component of ℓ, that is the height μ of the step formed by the grain-boundary displacement, is plotted against time (hours), blocks 1 - 7 showing the magnitude of this component at various points along the grain-boundary, as marked on the insert in Fig.6. It will be seen that not only the height of the step varies along the grain-boundary but that there is a point at which the grain-boundary displacement throughout the duration of the creep test remains smaller than at

any other point; in addition, the height of the step at certain points of the grain-boundary decreases with time (see point 3 after 14 hours, point 5 after 40 hours, etc). These results, correlated with the results of metallographic and X-ray analysis, show conclusively that the formation of steps at the grain-boundary during creep is not caused by grain-boundary sliding (relative movement of the adjacent grains) but is mainly a result of the difference in the degree of deformation of the crystals in the regions adjacent to the grain-boundary. Acknowledgments are made to the student I.B.Finkel'shteyn who participated in this work.
There are 8 figures, 1 table and 8 references: 3 Soviet and 5 non-Soviet. The four most recent references to English language publications read as follows: McLean D., Farmer M.H. J.Inst. Metals, 1956, October; Tung S.K., Maddin R. J.Metals, 1957, 9, No.7, Sec., 2, 905; Rhines F.N., Borud W.E., Kissel M.A. Trans. ASM, 1956, 48, 919; Intrater J., Machlin E.S. J.Inst. Metals, 1960, 88, No.7, 305.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Metal Science and Physics of Metals TsNIIChM)

SUBMITTED: September 9, 1960

80890

S/126/60/009/06/018/025
E073/E335

18.7500

AUTHOR: Rozenberg, V.M.

TITLE: Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 6, pp 922 - 926 (USSR)

ABSTRACT: It was established earlier that depending on the test conditions phase work-hardening may lead to an increase or to a decrease in the strength. Specimens subjected to phase work-hardening as a result of loading over long periods at elevated temperatures (700 °C) have a lower strength than specimens which were not subjected to phase work-hardening. This difference is due to structural transformations leading to a change in the grain properties but it can also be due to a change in the mechanism of deformation, which depends on the initial structure of the material. To verify the latter, it is advisable to investigate microscopically the picture occuring in the case of creep of solid-solution specimens. To eliminate the influence of grain boundaries such investigations are best carried out on single crystals. In the experiments

Card1/4

80890
S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

described in this paper, an alloy containing 30% Ni, 0.4% Ti, 0.15% Mn, rest Fe was used. An alloy of this composition represents a solid solution with a face-centred cubic lattice. On cooling the γ-solid solution below room temperature a martensitic γ→α transformation takes place. Heating of the transformed α-solid solution above 500 °C leads to a reverse, α→γ transformation, which is also of the martensitic type. The γ→α→γ transformation brings about a fragmentation of the γ-phase crystals into numerous small areas, disrupting the regular structure at the boundaries of these areas. Such changes in the intracrystalline structure lead to property changes. Two specimens, 2 x 1 x 10 mm, were produced by electro-erosion cutting of a single crystal; orientation of both relative to the tensile-stress axis was equal. According to analysis, sliding in these crystals should proceed in the plane (1̄11) in the direction [1̄10]. Both specimens were annealed at 1 350 °C for two hours and cooled to room temperature in the furnace. Then one of the specimens

Card2/4

80890

S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

was cooled in liquid nitrogen and subsequently heated (in vacuum) to 750 °C and held at that temperature for six hours, thus transforming it into the γ-phase. The specimens were tested at 700 °C with a tensile load of 2.5 kg/mm^2 in vacuum. After some stretching, the specimen was relieved of the load, cooled and removed from the vacuum chamber. The total elongation was measured and the surface was subjected to metallographic investigation. After fracture, the relief occurring at the surface of the specimens was studied by means of an interference microscope and the change in the orientation of the crystals relative to the tensile-stress axis was determined by X-ray diffraction. The obtained data lead to the conclusion that the difference in the behaviour of an annealed specimen and a specimen which was subjected to phase work-hardening is not due to qualitative changes in the deformation mechanism. Due to the presence of lattice defects in the transformed specimen the process of sliding will be more intensive in it than in annealed specimens.

Card3/4

80890
S/126/60/009/06/018/025
E073/E335

Slow Deformation of Single Crystals of an Iron-nickel Solid Solution at Elevated Temperatures

There are 5 figures and 6 Soviet references.

ASSOCIATION: Institut metallofiziki TsNIIChM (Institute of Metal Physics, TsNIIChM)

SUBMITTED: December 3, 1959

Card 4/4

BORZDYKA, A.M., doktor tekhn.nauk, ROZENBERG, V.M., kand.tekhn.nauk

"Theory of the creep and long-period strength of metals" by I.A.Oding and others. Reviewed by A.M.Borzdyka, V.M.Rozenberg. Zav.lab. 26 no.11:1327-1328 '60. (MIRA 13:11)
(Creep of metals) (Ivanova, V.S.) (Burdukskii, V.V.) (Geminov, V.N.) (Oding, I.A.)

10 7300 also 1413 26561 S/126/61/012/002/011/019
E021/E480

AUTHORS: Voloshina, L.A., Rozenberg, V.M. and Finkel'shteyn, I.B.

TITLE: The connection between boundary migration and deformation in the boundary zones during the creep of metals

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.2, pp.265-268

TEXT: Experiments were carried out on bicrystals of aluminium. The boundary between the crystals was at 45° to the strain axis of the sample. A stress of 200 g/mm^2 and a temperature of 300°C were used. Lines intersecting the grain boundary were drawn on the electropolished surface before test. During the creep test, the relative displacement of the lines (in the plane of observation) was measured by an interference microscope. Fig.2 shows (in microns) the relative displacement of the grains (circles) and the migration of the boundary (triangles) against time (in hours). Fig.3 shows a microphotograph of the bicrystal taken on the interference microscope (x280) and Fig.4 the profile of the same sample at the grain boundary. The data show that deformation in
Card 1/4

the boundary regions is not stopped when migration of the boundary occurs. Thus, the alternate relative displacement of grains and migration of boundary, as proposed in Ref.1 (Chang H.C., Grant N.J. J.Metals, 1952, No.6, 619) to explain the cyclic character of the deformation process in the boundary regions, is impossible. It is proposed that the cyclic nature of the process is caused by alternate hardening and softening, the softening in this case being connected with boundary migration. There are 4 figures and 11 references: 5 Soviet and 6 non-Soviet. The four most recent references to English language publications read as follows:

Chang H.C., Grant N.J. J.Metals, 1952, No.6, 619;
Rhines F.N., Bound W.E., Kissel M.A., Trans. ASM, 1956, 48, 919;
Tung S.K., Maddin R. J.Metals, 1957, 9, N7, sec.2, 905;
McLean D. Rev. met., 1956, 53, 139.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Science of Metals and Physics of Metals TsNIIChM)

SUBMITTED: December 19, 1960

APPROVED FOR RELEASE: 07/13/2001 CIA-RDP86-00513R001445610013-6"

24478
S/126/61/011/006/004/011
E193/E483

18 7300

AUTHOR: Rozenberg, V.M.

TITLE: The effect of substructure on creep f nickel

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.6, pp.899-909

TEXT: The effect of preliminary heat and mechanical treatment on the rate of creep has been quite extensively studied. Thus, for instance, D.McLean and A.S.L.Tate (Ref.1: Rev.met., 1951, 48, No.10, 765) showed that polygonization of aluminium grains, attained by rolling and subsequent annealing, reduced the rate of creep of this metal at 200°C by a factor of 200 to 5000. Similar results were obtained by other workers who, however, did not investigate the elementary processes associated with the deformation in creep. The object of the present investigation was to study the effect of substructure on both intra- and inter-crystalline deformation in creep of nickel, which had been selected for this purpose because of the existence of a large body of experimental evidence on creep of this metal and on the density of sub-boundaries after plastic deformation followed by annealing.
Card 1/9

Nickel of 99.9% purity with traces of Al, Si, Cu, Co and Fe was used in the experiments. It was established in a series of preliminary tests that if this material is plastically deformed (at room temperature) to less than 6% deformation, no new grains are formed on subsequent heating to 800°C. The flat creep test pieces used by the present author (with the gauge length measuring 40 x 3 x 2 mm) were polished and vacuum annealed at 1150°C for 2 - 3 hours, after which the average grain-size was 0.165 mm. They were then plastically deformed (at room temperature) in tension at a rate of strain of approx 30 mm/min to attain elongation varying between 0 and 6%, annealed at 800°C for 1 hour, and electrolytically polished. (In every case the average grain-size of the specimen remained equal to 0.165 mm.) The creep tests were all carried out in vacuum at 700°C and under a stress of 2.5 kg/mm^2. The tests were interrupted periodically and the test pieces, cooled to room temperature, were examined for total elongation, the number of grain boundaries and slip lines on the gauge length and the magnitude of displacement of both the grain boundaries and the slip lines. The results are reproduced

graphically. (Unless otherwise stated, the number ascribed to curves in the diagrams quoted below denote the degree (δ,%) of the preliminary plastic deformation of the creep test pieces.)
The general character of creep of the various test pieces is shown in Fig.1, where the elongation (%) is plotted against time (hours). It will be seen that with increasing degree of preliminary deformation the rate of creep decreased. Moreover, no transient stage of creep was observed in specimens, preliminarily deformed to $\delta \not> 5\%$. The effect of such structure on that part of deformation which is revealed by slip lines is illustrated in Fig.2, where the number of slip lines per 1 cm of the gauge length (n,1/cm) is plotted against time. Here, in every case, n increased initially and then remained constant at a level which decreased with increasing δ. In Fig.3, the displacement at the slip lines ($\bar{P}_{ck}$,μ) is plotted against time (hours). The data reproduced in Fig.2 and 3 were used to estimate the part played in creep of the test pieces studied by coarse slip; the results are given in Fig.4 where elongation due to coarse slip (ε_{ck},%) is plotted against time, and in Fig.5 where the ratio $\varepsilon_{ck}/\varepsilon_{общ}$ ($\varepsilon_{общ}$ denoting the total deformation) is plotted against $\varepsilon_{общ}$. The effect of
Card 3/9

substructure, formed as a result of preliminary mechanical and thermal treatment, on the deformation of creep test pieces due to relative movement of the grains is illustrated in Fig.6, where the relative displacement of the grains $\bar{P}_{rp}(\mu)$ is plotted against time. In Fig.7, gap $\bar{P}_{rp}(\mu)$ is plotted against $\varepsilon_{общ}(\%)$. The above data on the total elongation due to coarse slip and elongation due to relative movement of the grains were based on the results of measurements. The elongation due to fine slip could not be measured because the fine slip lines could not be observed under the microscope. However, the elongation due to fine slip ε_x is given by $\varepsilon_x = \varepsilon_{общ} - (\varepsilon_{ck} + \varepsilon_{rp})$ and the effect of substructure on this parameter is illustrated in Fig.9, where ε_x is plotted against time (hours); in Fig.10, ε_x is plotted against $\varepsilon_{общ}$. The results obtained were analysed in relation to the results obtained by other workers and the following conclusions were reached. (1) The creep properties of nickel are profoundly affected by preliminary plastic deformation (in tension) followed by annealing, since not only is the rate of creep reduced but the shape of the creep curves is altered. The higher the degree of preliminary deformation, the smaller is the total elongation attained during creep in any given time. (2) This effect of preliminary treatment (resulting in the development of substructure) is associated with slowing down of the processes of both coarse and fine slip in the interior of the grains. (3) The relative displacement of the grains which can be observed on the surface of creep test pieces is caused mainly by non-uniform deformation of the grains and not by the viscous flow along the grain boundaries. (4) The change of the behaviour of nickel during creep brought about by preliminary mechanical and thermal treatment is a manifestation of the effect of the resultant network of dislocations obstructing slip, which constitutes the main mechanism of deformation in creep. There are 10 figures, 1 table and 25 references: 7 Soviet-bloc and 11 non-Soviet-bloc. The four most recent references to English language publications read as follows: Hibbard W.R., Dunn C.G. Acta met., 1956, 4, No.3, 306; Dorn J.F., ASM, 1956, 255; McLean D., Farmer M.H., J.Inst. Metals, 1956-57, 85, 41; Parcer, E.R., ASM, 1956, 227.

ASSOCIATION: Institut metallovedeniya i fiziki metallov TsNIIChM (Institute of Science and Physics of Metals TsNIIChM)

PHASE I BOOK EXPLOITATION SOV/5525

Bagaryatskiy, Yuriy Aleksandrovich, Doctor of Physics and Mathematics; Yakov Mendelevich Golovchiner; Vera Alekseyevna; Emmanuil Zel'manovich Kaminskiy, Candidate of Physics and Mathematics; Viktor Mikhaylovich Kardonskiy; Vladislava Kazimirovna Kritskaya, Candidate of Physics and Mathematics; Leonid Ivanovich Lysak, Doctor of Technical Sciences; Yuriy Andreyevich Osip'yan; Mark Davydovich Perkas, Candidate of Technical Sciences; Vladimir Moiseyevich Rozenberg, Candidate of Technical Sciences; Naum Isaakovich Sandler, Candidate of Technical Sciences; Nadezhda Trofimovna Travina, Candidate of Physics and Mathematics; and Lev Markovich Utevskiy, Candidate of Technical Sciences.

Rentgenografiya v fizicheskom metallovedenii (Radiography in Physical Metallography) Moscow, Metallurgizdat, 1961. 368 p. 5,200 copies printed.

Sponsoring Agencies: Gosudarstvennyy nauchno-ekonomicheskiy Sovet SSSR. Tsentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii im. I.P. Bardina. Institut metallovedeniya i fiziki metallov.

Ed. (Title page): Yu. A. Bagaryatskiy; Ed. of Publishing House: Ye.K. Berlin; Tech. Ed.: Ye.B. Vaynshteyn.

Card 1/7

PURPOSE: This handbook is intended for x-ray technicians working in plant laboratories of the metallurgical and machine-manufacturing industry. It may also be useful to technical personnel in the field of applied x-ray diffraction analysis employed at scientific, technical, and educational institutions.

COVERAGE: The handbook contains basic information of the methods employed in metallography. It consists of four parts. Part I contains descriptions of methods for the study of polycrystals, including the special features of the work with sharp-focused tubes and ionization counters, preparation of specimens, and choice of radiation sources, filters, cameras, and geometry of the picture. Data on the photometering of x-ray pictures and on the application of electron diffraction techniques to metal science are also presented. Part II contains a detailed description of stresses and deformations in crystals of metal, as well as of new methods for measuring the size of grains and areas of coherent scattering. The material also contains data on methods for studying the recrystallization of metals for determining textures. Part III is devoted to x-ray phase analysis to be carried out with the aid of tables included in the appendix. Part IV deals with x-ray studies of steel that has been variously treated by thermal and thermochemical methods. No personalities are mentioned. There are 282 references: 199 Soviet, 55 English, 26 German, and 2 French.

Card 2/7

ROZENBERG, V. M.

PHASE I BOOK EXPLOITATION SOV/5505

Moscow. Institut stali

Relaksatsionnyye yavleniya v metallakh i splavakh; trudy Mezhvuzovskogo soveshchaniya (Relaxation Phenomena in Metals and Alloys; Transactions of the Inter-Institute Conference) Moscow, Metallurgizdat, 1960. 326 p.

Sponsoring Agency: Ministerstvo vysshego i srednego spetsial'nogo obrazovaniya RSFSR and Moskovskiy institut stali imeni I.V. Stalina.

Ed. (Title page): B.N. Finkel'shteyn; Ed. of Publishing House: Ye.I. Levit; Tech. Ed.: A.I. Karasev.

PURPOSE: This collection of articles is intended for personnel in scientific institutions and schools of higher education and for physical metallurgists and physicists specializing in metals. It may also be useful to students of these fields.

COVERAGE: The collection contains results of experimental and theoretical investigations carried out by schools of higher education and scientific research institutions in the field of the relaxation phenomena in metals and alloys. Several articles are devoted to the investigation—by the internal-friction method—of the decomposition of supersaturated solid solutions. Also analyzed are the defects of the crystalline lattice, plastic deformations, high-temperature behavior of alloys, and creep. Problems of the relation between internal friction and temper brittleness, the use of the method of internal friction in the investigation of powder-metallurgy products, and the mechanism of impact fatigue are discussed. The collection also contains articles on the damping characteristics of materials, elastic after-effect, and the new slow-detection method. No personalities are mentioned. References follow most articles. There are 366 references: 192 Soviet and 174 non-Soviet.

Card 7/9

GORELIK, S.S.; KAL'YANOVA, S.M.; ROZENBERG, V.M.

Structural changes in aluminum with weak deformation and subsequent heat treatment. Fiz. met. i metalloved. 10 no.2:251-261 Ag '60. (MIRA 13:9)

1. TSentral'nyy nauchno-issledovatel'skiy institut chernoy metallurgii.
(Aluminum--Metallography) (Deformations (Mechanics))

ROZENBERG, V.M.

Slow deformation of single crystals of iron-nickel solid solutions at high temperatures. Fiz. met. i metalloved. 9 no.6:922-926 Je '60. (MIRA 13:7)

1. Institut metallofiziki, TSentral'nyy nauchno-issledovatel'skoyy institut chernoy metallurgii.
(Iron-nickel alloys--Metallography)
(Metals at high temperatures)

Effect of salt formation on the toxicity of triphenylarsenic dihydroxide. V. N. Rozenberg. *J. Physiol. (U. S. S. R.)* 24, 1101-8(1938); *Chem. Zentr.* 1930, I, 465. By detg. the fatal dose of triphenylarsenic dihydroxide, its sulfate, and its nitrate on white mice, it was demonstrated that the toxicity of the base is decreased 1-11 times by salt formation. Since only the free base, when administered in sublethal doses, causes injury to the liver, while the salts do not injure this organ, the toxic character must be changed by salt formation.

M. G. Moore

TIMOFEYEV, A.N.; ROZENBERG, V.N.

GAK-3M gravimeter with an electric thermostat. Geofiz. razved. no.6:93-95 '61. (MIRA 15:4)

(Thermostat)
(Gravimeter (Geophysical instrument)--Electric equipment)

POBORCHIY, Vsevolod Sergeyevich; ROZENBERG, V.N., red.; FREGER, D.P., red. izd-va; BELOGUROVA, I.A., tekhn. red.

[Experience in the automation of steam boilers fired with gas]Opyt avtomatizatsii parovykh kotlov, rabotaiushchikh na gazoobraznom toplive. Leningrad, 1962. 22 p. (MIRA 15:10)

(Boilers--Firing) (Automatic control) (Gas as fuel)

S/080/63/036/001/026/026
D204/D307

AUTHORS: Motsarev, G.V. and Rozenberg, V.R.

TITLE: On the problem of preparing bis(trichloromethyl)dichlorosilane

PERIODICAL: Zhurnal prikladnoy khimii, v. 36, no. 1, 1963, 231 - 232

TEXT: The present work is communication IV in the series of papers dealing with the halogenation of aliphatic silanes and siloxanes. Bis(trichloromethyl)dichlorosilane (I) was prepared in 44% yield by passing gaseous Cl_2 into a solution of 210 g $Cl_3C.CH_3SiCl_2$ in 20 g Cl_2, at 60°C, over 66 hrs, at 6.1 g/hr, using azo-bis-iso-butyronitrile as an initiator. CCl_3SiCl_3 and $CCl_3.CHCl_2SiCl_2$ formed as by-products. Compound I could also be prepared in CCl_4 (not less than 5 mol %) using uv irradiation as the initiator, at 20 - 25°C, over 66 hrs, at 6.1 g Cl_2/hr. The latter method yielded 60 % of I. $CCl_3.SiCl_3$

Card 1/2

and $CCl_3.CHCl_2SiCl_2$ formed as by-products. E.F. Kirbyakova and V.T. Inshakova took part in the experimental work.

SUBMITTED: November 13, 1961

ACCESSION NR: AP4032495 S/0080/64/037/004/0747/0749

AUTHOR: Motsarev, G. V.; Rozenberg, V. R.

TITLE: Thermal decomposition of trichloromethyltrichlorosilane. Communication IX

SOURCE: Zhurnal prikladnoy khimii, v. 37, no. 4, 1964, 747-749

TOPIC TAGS: trichloromethyltrichlorosilane, thermal stability, thermal decomposition, monochloromethyltrichlorosilane, dichloromethyltrichlorosilane

ABSTRACT: The thermal stability of the chloro derivatives of methyltrichlorosilane was studied. The mono- and dichloromethyltrichlorosilane are completely stable on boiling, even in the presence of anhydrous $FeCl_3$. Trichloromethyltrichlorosilane readily decomposes on boiling (160-175C) to form a 90% yield of $SiCl_4$ and 13% yield of C_2Cl_4. Orig. art. has: 2 equations.

ASSOCIATION: None

SUBMITTED: 18Mar63 DATE ACQ: 11May64 ENCL: 00

SUB CODE: GC NO REF SOV: 002 OTHER: 001

Card 1/1

ACCESSION NR: AP4032507

S/0080/64/037/004/0920/0922

AUTHOR: Motsarev, G. V.; Rozenberg, V. R.

TITLE: Initiating the chlorination reaction of methylchlorosilanes with acetylcyclohexylsulfonyl peroxide. Communication VII in the series.

SOURCE: Zhurnal prikladnoy khimii, v. 37, no. 4, 1964, 920-922

TOPIC TAGS: chlorination, methylchlorosilane, acetylcyclohexylsulfonyl peroxide, initiator, chlorination iniator, chloromethyltrichlorosilane, polychloromethyltrichlorosilane, dimethyldichlorosilane, polychlorodimethyldichlorosilane, azobisisobutyronitrile, ultraviolet light

ABSTRACT: The chlorination of methyltrichlorosilane and dimethyldichlorosilane iniated by acetylcyclohexylsulfonyl peroxide was investigated. Reaction proceeds very low at 24-30C. At 50C with a $CH_3SiCl_3:Cl_2$ molar ratio of 1:0.3 there is complete conversion of the chlorine, forming 1 weight part of the monochlor- to 1.15 parts of polychloromethylsilanes. Reducing the peroxide ratio to 1:0.2 reduces the polychloro derivatives to 0.84 parts. The initiating action of this peroxide exceeds that of azobisisobutyronitrile and approaches that of ultra-