S/601/61/000/013/003/017
D207/D302

AUTHORS: Dekhtyar, I. Ya. and Mikhalenkov, V. S.

TITLE: Determining momenta of the conduction electrons in copper-manganese alloys

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut metalofyzyky. Sbornik nauchnykh rabot, no. 13, 1961. Voprosy fiziki metallov i metallovedeniya, 70-73

TEXT: The authors report on determination of the conduction-electron momenta in polycrystals of copper and Cu-Mn alloys containing 0.54, 1.0, 1.55 and 2.07 at.% Mn. The technique was the same as in the authors' earlier work (Ref. 4: Voprosy fiziki metallov i metallovedeniya, no. 12, 1960). Angular distribution of gamma-rays resulting from positron-electron annihilation was recorded. From this distribution the maximum values of the electron momenta p_m were calculated. A plot of p_m against the Mn content showed a minimum of

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Determining momenta of ...

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$P_m = 1.8 \times 10^{-24}$ kg.m/sec at 1.35% Mn, where an electric resistance maximum was found earlier by the authors. The results were used to calculate the scattering cross-section of electrons on Mn impurity atoms: This cross-section fell with increasing Mn in the alloys. The electrical resistivity per one vacancy was estimated for all four alloys; the values agreed with those calculated by the authors in a different way. There are 3 figures, 1 table and 9 references: 4 Soviet-bloc and 5 non-Soviet-bloc. The 4 most recent references to the English-language publications read as follows: S. Berko and J. S. Plaskett, Phys. Rev., 112, 1877, (1958); R. J. Shmitt and I. S. Jacobs, Phys. Chem. Solids, 3, 324, (1957); C. A. Domenicali, Phys. Rev., 112, 1863, (1958); J. S. Koeler, F. Seitz and I. E. Bauerle, Phys. Rev., 107, 1499, (1957).

SUBMITTED: September 15, 1960

Card 2/2

S/185/61/006/001/010/011
D210/D305

18 7500

AUTHORS: Hertsriken, S.D., Dekhtyar, I.Ya., Mikhalenkov, V.S. and Palchenko, V.M.

TITLE: Study of electrical transfer in steels by the method of inert tags

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 6, no. 1, 1961, 129-135

TEXT: This study is a continuation of a previous work (Ref. 5: S.D. Hertsriken, I.Ya. Dekhtyar, V.S. Mikhalenkov, E.M. Madatova, UFZh, 5, 79, 1960) in which details of the investigation method were described. In this article it is only stated that molybdenum inert tags were used, incorporated into the studied samples and that their dislocation was measured by means of a comparator with precision of 2 m. In the present work two kinds of steel: "40" and "U8" with carbon contents 0.35 and 0.7% respectively were studied. As inert tags are able to move only into vacant nodes of crystal-lattices the latter have to be abandoned by iron ions. The

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Study of electrical transfer ...

direction of tags motion is opposite to that of iron ions. The mass of transferred ions, expressed in gram-ions equals $\Delta M = \frac{Sq}{V}$ where S - the magnitude of the tag dislocation, q - the cross section of the sample, V - the molar volume. The number of tags transfer n equals $n = \frac{UF}{Vi}$ where V - velocity of tag motion, F - Faraday, i - current density, V - molar volume. Experiments were carried out at 945 and 1020°C, the temperature controlled by a chromium-aluminum thermocouple, with a direct current density of 12-15 a/mm^2 [Abstracter's note: In the given table the current density is given as 10^{-3}a/cm^2]. The dependence of the magnitude of tags displacement from the time of passing the direct current is a linear one for each sample, temperature and current density. In all the experiments it has been found that tags were displaced toward the cathode and iron-ions - toward the anode. The authors explain this phenomenon as the result of interaction of C and Fe electrons, the carbon valency electrons filling the 3d energy level of iron atoms, conferring on them a negative charge. At every time-moment only a part of

Study of electrical transfer ...

iron atoms form negatively charged ions and are able to migrate toward the anode. The velocity of iron ions migration was found to increase with the rise of temperature which is not in agreement with experiments on 0.1% carbon steel. The authors endeavored to determine the iron ions electric charge by means of the formula $E_a = Q = RTy_cthy$ where E_a - activation energy of diffusion, and Q - activation energy of the process, but found that the value of Q is too similar to that of E_a and, therefore, the formula was useless. They used instead another formula: $z = \frac{RTAU}{F^2\rho d D}$

where z - electric charge, d - specific gravity, ρ - specific electric resistance, D - diffusion coefficient. The values of z have been found as follows: for steel "40": 1.4 at 945°C and 1.03 at 1020°C; for steel "U8" 0.85 at 945°C and 0.3[illegible] at 1020°C, which proves the decrease of the electric charge with the rise of temperature and the rise in carbon content. These results are regarded by the authors as relatively correct only. This statement has been verified by the authors by determining the micro-hardness of samples after treatment. A sample of steel "40" was subjected to

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S/185/61/006/001/010/011
Study of electrical transfer... D210/D305

the action of direct electric current density 15,000 a/cm^2, for 4 hours at 1020°C and after quenching, the distribution of microhardness was studied. The hardness of the anode part of the sample markedly decreased and at the cathode end, increased which proves the migration of carbon ions towards the cathode. The cathode part of the sample seemed to be composed entirely of martensite, while the anode part was almost of pure ferrite with a few inclusions of martensite. There are 5 figures, 1 table and 9 references: 7 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: H.W. Mead, G.E. Birchenal, J. Met. 8 sec. 2 1956, Metals Handbook, A.S.M. Cleveland, 1948.

ASSOCIATION: Institut metalofiziki, AN USSR, Kiyev (Institute of Metallophysics, AS UkrSSR, Kiyev)

SUBMITTED: June 18, 1960

Card 4/4

S/185/61/006/002/012/020
D210/D304

AUTHORS: Dekhtyar, I.Ya., Lytovchenko, S.H., and Fedchenko, R.H.

TITLE: Effect of plastic deformation on the electrical resistance of alloys

PERIODICAL: Ukrayinskyy fizychnyy zhurnal, v. 6, no. 2, 1961, 233 - 238

TEXT: The authors describe the influence of vacancies and dislocation in alloys on the electrical resistance of the alloys. There exists a large amount of theoretical data on the effect of plastic deformations on electrical resistance and the main purpose of this study was to check this theory as well as the authors' theory presented in an earlier publication which states that

$$\frac{\Delta\rho}{\rho_0}=\frac{\rho_v}{\rho_0}flb^{-2}k\varepsilon^{1/2}+\frac{\rho_d}{\rho_0}k\varepsilon^{1/2}=A\varepsilon^{1/2}+B\varepsilon^{1/2}, \quad (1)$$

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ρ - increase of specific resistance; ρ_o - initial specific resistance; ρ_v - resistance due to one vacancy; ρ_d - resistance due to one dislocation; b - Buerger's vector; l - mean length of free dislocation run; f - coefficient specifying the effective number of steps which are the source of dislocations. From this equation, the constants A and B, and hence ρ_v and ρ_d can be easily calculated by plotting experimental values of $\Delta\rho\varepsilon^{-1/2}/\rho_o$ against ε as this should give a straight line. Experimental resistivity measurements were made on Fe + Mo (0.9 to 1.5 %) at room temperature and Fe + 1.0 at .% Ni, Fe + 0.9 at .% Mo, and Fe + 0.9 at .% V at 78°K. The samples were in the form of 0.5 mm diameter wire, 9 cm long and they were strained up to 10 % at room temperature, and up to 150 % at 78°K. The resistance measurements were made with a potentiometer and a sensitive galvanometer. For the Fe + Mo alloy measurements carried out at room temperature the plot of $\Delta\rho/\rho_o$ against ε^+ gave straight lines implying that the principal cause of resistance in-

crease is due to dislocations. This can be explained by concentrating vacancies near the admixed atoms, forming a "modified admixture". The Mo concentration in this experiment had no significant effect, probably because it was very high (0.9 %) in the lowest concentration. On the basis of k determined in the previous experiment, ρ_d was found to be $17 \cdot 10^{-14}$ $\mu\Omega$ cm/cm^{-2}. No appreciable change in resistance was found on annealing for 8 hours at 100°C after 10 % deformation of a Fe + Mo specimen. For low temperature measurements the deformation was effected at room temperature while the resistivity was measured at 78°K. After a certain deformation a limit in the number of defects is reached and the resistivity reaches a limiting value. By plotting these curves according to Eq. (1) straight lines were obtained in each case. Fe + Mo gave A = 0.037 and B = 0.011. The curve for Fe + Ni, plotted up to ϵ = 70 %, gave a straight line going through the origin implying that the main source of resistance are vacancies, with the relationship $\Delta\rho/\Delta\rho_0 = 0.01\,\epsilon^{3/2}$. For the vanadium alloy A was found to be zero

and B = 0.095. The differences between these curves are attributed by the authors to the affinity of the admixed atoms for the vacancies, being greatest for V and least for Ni. Other factors which may affect the resistivity are the scattering of electron waves by point defects (vacancies) and dislocations, and the interaction of point defects with dislocations. There are 3 figures and 7 references: 1 Soviet-bloc and 6 non-Soviet-bloc. The references to the 4 most recent English-language publications read as follows: P. Jongenburger, Phys. Rev., 90, 710, 1953; F. Seitz, Advances in Physics, 1, 43, 1952; S.C. Hunter, N.F. Nabarro, Proc. Roy. Soc., 1953 220, 542; W.A. Harrison, Phys. Chem. of Solids, 1958, t. 5, 44-46.

ASSOCIATION: Instytut metalofizyky AN URSR m. Kyyiv (Institute of Metal Physics AS UkrSSR, Kiyev)

SUBMITTED: June 18, 1960

S/126/61/011/004/001/023
E073/E335

AUTHORS: Dekhtyar, I.Ya. and Madatova, E.G.

TITLE: Change of the Magnetostriction Saturation During Annealing of a Hardened Ferromagnetic

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.4, pp.507-512

TEXT; In an earlier paper (Ref.1) the authors have shown that the change in the coercive force under conditions of low-temperature annealing of a ferromagnetic which has been hardened from a high temperature is due to the fact that the dislocation loops arising during hardening increase with increasing annealing time. This leads to an increase in the dimensions of the dislocation loops which, in turn, brings about an increase in the coercive force. The maximum possible increase in H_c during annealing is determined by the time required for the confluence of all point defects to the dislocation loops to take place. From this time onwards H_c remains almost unchanged. The authors investigated the change in the saturation magnetostriction during low-temperature tempering

of ferromagnetics originally hardened from a high temperature. The case is considered where the hardening temperature is higher than the Curie point and sufficiently high to produce dislocation loops. According to earlier work (Ref.1), for nickel as a ferromagnetic, the required conditions are satisfied by hardening from temperatures above 900°C. In this paper a new method of measuring the saturation magnetostriction is described, which is based on studying the kinetics of the change in the magnetostriction of low-temperature annealed nickel, previously hardened from 900, 1000 and 1100°C. The use of this method for investigating changes in the saturation magnetostriction is also described. The method is based on applying the quadrature dependence of the sag of a suspended wire λ on its length (Fig.1):

$$\frac{l' - l}{l} = \frac{2}{3} \frac{\lambda_0^2}{l^2} \qquad (4) .$$

In Fig. 1, λ_o is the initial sag in the absence of any field and $\Delta\lambda_H$ is the absolute change in this quantity on switching-on the saturation field, H . The sensitivity of the method is of the order of 10^{-7} for initial specimen lengths of 100 - 120 mm. The main advantages of the method are its high sensitivity and speed. The formula used for the calculations was applied by S.D. Gertsriken and one of the authors for creep tests. The method was used for studying the kinetics of changes in the magnetostriction of nickel, tempered at low temperatures after being hardened from 900, 1 000 and 1 100 °C. The plots, Figs. 2 and 4, show the dependence of the saturation magnetostriction λ_s of nickel originally hardened from 900, 1 000 and 1 100 °C, respectively.

on the time of tempering at a tempering temperature of 100 °C. The obtained relations are explained on the basis of the concept that germination of regions of remagnetisation occur on semi-fixed ring-shaped dislocations which are produced during hardening of nickel from low temperatures. On the basis of experimental data, the energy parameters were determined which characterise the behaviour of defects in the metal. There are 5 figures and 6 references: 2 Soviet and 4 non-Soviet.

ASSOCIATION: Institut metallofiziki AN UkrSSR (Institute of Physics of Metals, AS Ukrainian SSR)

SUBMITTED: June 15, 1960

Fig. 1:

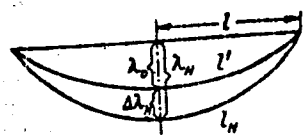


Fig. 2:

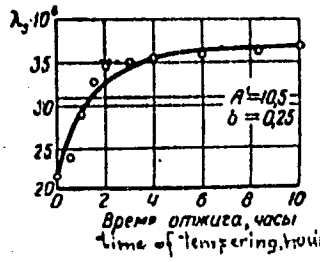
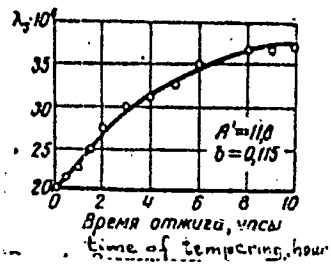


Fig. 4:



Card 5/5

18 8100

25913 S/126/61/012/001/004/020
E073/E535

AUTHORS: Dekhtyar, I. Ya. and Levina, D. A.

TITLE: Study of the influence of plastic and elastic deformation on the coercive force of ordering and non-ordering alloys

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.1, pp. 30-37

TEXT: Ya. S. Shur and V. A. Zaykova (Ref.12: FMM, 1958, 4,3) found that tensile stresses lead to a displacement of domain boundaries and they assume that, under the effect of elastic loads, the direction of easy magnetization in a single crystal which is nearest to the axis in which the tensile stresses are applied will become the direction of still easier magnetization. The authors of this paper studied the influence of plastic deformation on the coercive force of nickel and of iron-base non-ordering alloys containing Al (2.5 and 8%) and 8% Cr, binary ordering alloys Ni_3Mn (23.7 at.% Mn) and Ni_3Fe and ternary ordering alloys Co-Ni-Mn (No.1 - 20% Co, 60% Ni, 20% Mn; No.2 - 40% Co, 40% Ni, 20% Mn; No.3 - 60% Co, 20% Ni, 20% Mn).

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Study of the influence of plastic ... S/126/61/012/001/004/020
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All the alloys were produced from high purity materials in a high frequency furnace in an argon atmosphere. The ingots were forged into rods, homogenized in vacuum at 1000 to 1200°C for 150 hours, machined to a depth of 2 to 3 mm and then drawn into wire of 1 mm diameter (specimen length 30 mm). The specimens intended for studying the influence of elastic deformation on the coercive force were 0.41 mm diameter and 30 mm long. Following that, all the specimens were covered by a film of aluminium oxide and packed into nickel foil and, to relieve the stresses, the specimens were annealed in vacuum for two hours at the following temperatures: 900°C (Fe-Al alloys), 750°C (Fe + 8% Cr) and 1000°C (Ni_3Mn, Ni_3Fe, Co-Ni-Mn). After preliminary annealing, the specimens of the ordering alloys (Ni_3Mn, Ni_3Fe, Ni-Co-Mn) were subjected to an ordering anneal. The specimens of the Ni_3Fe alloys were annealed in vacuum at 450°C for 170 hours, those of the Co-Ni-Mn alloys were annealed at 430°C for 150 hours. The specimens of the Ni_3Mn alloy were subjected successively to the following heat treatments: 276°C - 95 hours, 310°C - 101 hours, 340°C - 50 hours, 355°C - 47 hours, 440°C - 28 hours. Following that, some of the

Study of the influence of plastic ... S/126/61/012/001/004/020
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specimens were water quenched from 440°C, whilst for the others annealing continued as follows: 500°C - 13 hours, 520°C - 13 hours, 525°C - 5 hours, 530°C - 5 hours, 550°C - 8 hours, 580°C - 5 hours, 600°C - 8 hours, 620°C - 5 hours, 650°C - 5 hours. After annealing at 650°C all the specimens were water quenched. Thus, each group of the Ni_3Mn specimens was characterized by a definite degree of ordering and for each of these coercive force, H_c, Oe vs. degree of deformation, ε,% , curves were obtained. For Ni and for the non-ordering alloys, the curves H_c vs. $\varepsilon^{1/4}$ represent straight lines, which confirms the dependence $H_c \sim N_d^{1/2}$ if data on internal friction in iron are taken into consideration. Thus, the increase in coercive force on increasing the degree of plastic deformation is due to the braking of the domain boundaries on the continuously increasing number of dislocations. The results for the ordering alloys after plastic deformation are plotted: in Fig.3 for Ni_3Mn (for specimens annealed at the following temperatures: curve 1 - 490°C, curve 2 - 440°C, curve 3 - 650°C); in Fig.4 for Ni_3Fe (curve 1 - annealed at 450°C, curve 2 - quenched from 1000°C); in Fig.5 for the

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alloys 20% Co + 60% Ni + 20% Mn (curve 1); 40% Co + 40% Ni + 20% Mn (curve 2); 60% Co + 20% Ni + 20% Mn (curve 3) (———— ordered state, ------- disordered state). Fig.6 shows the dependence of the coercive force on the degree of elastic deformation for the alloys Fe + 8% Cr (curve 1 - left-hand scale H_c, Oe) and the alloy Fe + 2.5% Al (curve 2 - right-hand scale H_c, Oe). In the case of ordering alloys, the coercive force during plastic deformation is determined by the interaction of two processes: an increase in the density of dislocations, which leads to an increase in H_c, and a destruction of the ordering, which leads to a decrease in the coercive force. In the case of elastic deformation of the alloys Fe + 2.5% Al and Fe + 8% Cr, the coercive force in the elastic deformation range decreases with increasing degree of deformation. This is explained by the fact that the elastic stretching leads to a redistribution of the directions of easy magnetization in such a way that in each block the direction which is nearest to the direction of the tensile stress will become the direction of easier magnetization. This state corresponds to the lowest boundary energy, which leads to a

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E073/E535

decrease in the coercive force. In polycrystalline specimens the coercive force will not always decrease with increasing degree of elastic deformation. It will depend on whether the crystallographic anisotropy of the lattice or the axial anisotropy caused by the tensile stresses is predominant. The first factor brings about a decrease in the coercive force, whilst the second leads to an increase of the boundary energy of the domains, which impedes the processes of remagnetization and thus increases the coercive force. There are 6 figures and 16 references: 8 Soviet-bloc and 8 non-Soviet-bloc. The references to English-language publications read as follows: Ref.5. Köster, W., Bangert, I., Acta met., 1955, 3, 274; Ref.11, Brown, N., Herman, M., J.Metals, 1956, 8, sec.2, 1353).

ASSOCIATION: Institut metallofiziki AN UkrSSR
(Institute of Physics of Metals AS UkrSSR)

SUBMITTED: February 16, 1960 (initially)
November 12, 1960 (after revision)

Card 5/7

18.8200

27475
S/032/61/027/009/014/019
B101/B220

AUTHORS: Dekhtyar, I. Ya., and Madatova, E. G.

TITLE: Exchange of experience

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 9, 1961, 1166

TEXT: A special apparatus was designed by the authors to study the deformation of specimens caused by repeated quenching (see Fig.). Tube 3 of heat-resistant steel is inserted into furnace 1 and quenching tank 2; specimen 4 is moved in this tube. The time of heating and cooling is regulated by drum 5 which is mounted on the motor shaft. When the drum is rotated, relay 6 reverses the direction of rotation of motor 7, on the shaft of which disk 8 is fixed. A special arresting device stops the disk after every individual rotation. Counter 9 records the number of cycles of thermal treatment. The apparatus was used for studying the deformation of aluminum, silver, gold, and platinum specimens on cyclic quenching in vacuo. Vacuum oil was filled into tube 3 sealed at its bottom end; furnace 1 and disk 8 were put into an evacuated vessel. Cyclic quenching

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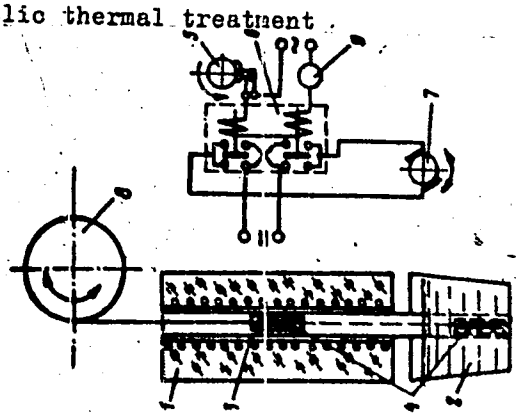
Exchange of experience

resulted in a change of the diameter and length of the specimens, but their volume remained practically constant. [Abstracter's note: Complete translation]. There is 1 figure.

ASSOCIATION: Institut metallofiziki Akademii nauk USSR (Institute of Physics of Metals, Academy of Sciences UkrSSR)

Fig. Scheme of the apparatus for cyclic thermal treatment.



Card 2/2

S/020/61/136/001/010/037
B019/B056

AUTHORS: Dekhtyar, I. Ya. and Mikhalenkov, V. S.

TITLE: The Temperature Effect Produced Upon the Angular Correlation of the γ-Quanta Formed During the Annihilation of Positrons and Electrons in Bismuth

PERIODICAL: Doklady Akademii nauk SSSR, 1961, Vol. 136, No. 1, pp. 63-65

TEXT: In an earlier paper the authors investigated the angular distribution of the γ-quanta formed during the annihilation of positrons and electrons in bismuth at room temperature. The investigations were carried out on a bismuth single crystal and showed a marked anisotropy of the energy surface cross section which is perpendicular to the main axis of the crystal. The anisotropy is about 14%. The angular correlation curves, among other things, depend on the interaction of the positrons and the lattice vibrations. It is therefore of importance to know the effect produced by temperature upon the angular correlation. In Fig. 2 the mean values of the maximum momenta of the electrons in mc-units (m = photon mass, c = velocity of light) for 300°K (curve 1) and for 90°K (curve 2) are

graphically represented. As may be seen, the anisotropy at 90°K is much lower (about 8%) than at 300°K (about 15%). The results obtained indicate a change in the character of the positron-electron annihilation. In the case of low positron energy, the single-photon annihilation is considerably less probable than the two-photon annihilation. In the case of positron energies of about $10m_0$ (m_0 is the positron mass), the ratio between the single-photon annihilation and the two-photon annihilation in bismuth is 0.2. The difference between the surfaces bounded by the curves 1 and 2 in Fig. 1 yields the decrease of the total number of positrons taking part in two-photon annihilation. This decrease is, in the given case, 30%. The authors thank A. A. Smirnov and M. A. Krivoglaz for discussions. There are 2 figures, 1 table, and 3 references: 2 Soviet and 1 US.

ASSOCIATION: Institut metallofiziki Akademii nauk USSR (Institute of the Physics of Metals of the Academy of Sciences UkrSSR)

The Temperature Effect Produced Upon the Angular Correlation of the γ-Quanta Formed During the Annihilation of Positrons and Electrons in Bismuth

S/020/61/136/001/010/037
B019/B056

PRESENTED: July 15, 1960, by G. V. Kurdyumov, Academician

SUBMITTED: July 13, 1960

Legend to Fig. 1: Angular distribution of γ-quanta at 90°K (curve 1) and at 300°K (curve 2). Legend to Fig. 2: Angular diagram of the effective maximum momenta of electrons in bismuth at 300°K (curve 1) and at 90°K (curve 2).

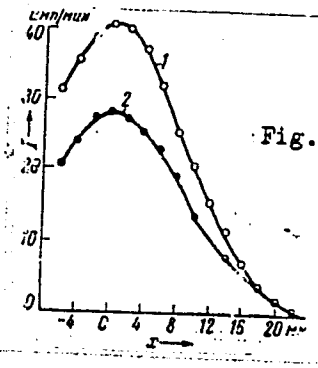


Fig. 1

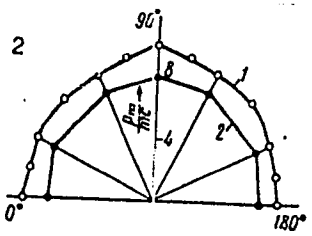


Fig. 2

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S/020/6[illegible]/140/0[illegible]
B104/B102

AUTHORS: [illegible] I. Ya., and Mikhalenkov, V. S.

TITLE: [illegible]he angular correlation of gamma q[illegible] on [illegible] electron annihilation in zinc

PERIODICAL: Akademiya nauk SSSR. Doklady. v. 140, no. 6 [illegible]

TEXT: The [illegible] ed the anisotropy in the electron [illegible] zinc single [illegible] .98 % Zn). Because of the differen[illegible] distances in th[illegible] plane (2.6995 Å) and in the plane pa[illegible] principal axis ([illegible] Å) a considerable anisotropy of the [illegible] tum was to be [illegible] The angular distribution of the [illegible] measured at nitr[illegible] room temperatures. The half-widths [illegible] distribution curv[illegible] unambiguously related to the maxim[illegible] momentum (R. E. [illegible] A. T. Stewart, Phys. Rev., 98, 48[illegible] half-widths of th[illegible]ar gamma quantum distributions b[illegible] the principal axis and $b_\perp$ (perpendicular to the princ[illegible] follows:

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Study of the ... relation of ...

S/020/6[illegible]
B104/B102

	300°K
$b_{\parallel}$	42
$b_{\perp}$	37

The anisotr... f-widths at both temperatures ... effective m... n momenta are determined from th... part of the ... curves. The result is the same ... tropy. Dat... ptibility of zinc crystals (I. A. ... Rev., 71, 5[illegible] (...ys. Rev., 76, 413, 62[illegible] (1949)) at ... ratures are ... these results. There is a qual... ity between ... y in susceptibility and the ani... maximum ele... . If the ion contribution to ... susceptibil... pic, the electron contribution ... bility will be ... $\chi_{\perp}^{(e)} = 4.9 \cdot 10^{-6}$, $\chi_{\parallel}^{(e)} = 2 \cdot 10^{-6}$. struction of ... tribution curves is discussed. It ... that part of the ... ns with a momentum $p > p_m$ are produ... lation of d-... The contribution of d-electrons ... direction is ... n in parallel direction. With an ... temperature the ... w the curve of angular correlation ...

Card 2/3

Study of the angular correlation of ...

This corresponds to a contribution of single-photon annihilation. The authors thank I. A. Naskidashvili for having grown the single crystal. There are 1 table, 3 figures, and 8 references: 4 Soviet and 4 non-Soviet. The 2 most recent references to English-language publications read as follows: N. F. Mott, H. Jones, The Theory of the Properties of Metals and Alloys, London. 1938; A. T. Stewart, Canad. J. Phys., 35, 168 (1957).

PRESENTED: May 20, 1961, by G. V. Kurdyumov, Academician

SUBMITTED: May 18, 1961

Card 3/3

DEKHTYAR', I. YA.

90

PHASE I BOOK EXPLOITATION SOV/6176

Konobeyevskiy, S. T., Corresponding Member, Academy of Sciences USSR, Resp. Ed.

Deystviye yadernykh izlucheniy na materialy (The Effect of Nuclear Radiation on Materials). Moscow, Izd-vo AN SSSR, 1952. 383 p. Errata slip inserted. 4000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk; Otdeleniye fiziko-matematicheskikh nauk.

Resp. Ed.: S. T. Konobeyevskiy; Deputy Resp. Ed.: S. A. Adasinskiy; Editorial Board: P. L. Gruzin, G. V. Kurdyumov, B. M. Levitskiy, V. S. Lyashenko (Deceased), Yu. A. Martynyuk, Yu. I. Pokrovskiy, and N. F. Pravdyuk; Ed. of Publishing House: M. G. Makarenko; Tech. Eds: T. V. Polyakova and I. N. Dorokhina.

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9C

The Effect of Nuclear Radiation (Cont.) SOV/6176

PURPOSE: This book is intended for personnel concerned with nuclear materials.

COVERAGE: This is a collection of papers presented at the Moscow Conference on the Effect of Nuclear Radiation on Materials, held December 6-10, 1960. The material reflects certain trends in the work being conducted in the Soviet scientific research orginization. Some of the papers are devoted to the experimental study of the effect of neutron irradiation on reactor materials (steel, ferrous alloys, molybdenum, avial, graphite, and nichromes). Others deal with the theory of neutron irradiation effects (physico-chemical transformations, relaxation of internal stresses, internal friction) and changes in the structure and properties of various crystals. Special attention is given to the effect of intense γ-radiation on the electrical, magnetic, and optical properties of metals, dielectrics, and semiconductors.

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Andronikashvili, E. L., N. G. Politov, and M. Sh. Getiya. Effect of Irradiation in a Reactor on Structure and Hardness of Alkali-Halide Crystals 277
The irradiation was conducted in the IRT-2000 Reactor at the Physics Institute of the Georgian Academy of Sciences.

Orlov, A. N. Use of Electronic Computers for Calculating Radiation Disturbances in Metals 288

Dekhtyar, I. Ya., and A. M. Shalayev. Change in Physical Properties of Ferromagnetic Metals and Alloys Caused by γ-Radiation 294

Gevtsriken, S. D. (Deceased), and N. P. Plotnikova. Effect of γ-Irradiation on Processes of Ordering and Disordering in Fe-Al Alloys 306

Konozenko, I. D., V. I. Ust'yanov, and A. P. Galushka. γ-Conductivity of Cadmium Selenide 308

DEKHTYAR, I.Ya.; LEVINA, D.A.; MIKHALENKOV, V.S.

Effect of compression from all sides on the magnetization saturation of iron-nickel alloys. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.14:37-45 '62. (MIRA 15:6)
(Iron-nickel alloys--Testing) (Magnetization)

S/601/62/000/015/003/010
A004/A127

AUTHORS: Dekhtyar, I.Ya., Mikhalenkov, V.S., Fedchenko, R.G.

TITLE: Rating of the interatomic action in ferrochromium alloys at high temperatures

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut metalofyzyky. Sbornik nauchnykh rabot. no. 15. Kiev. 1962. Voprosy fiziki metallov i metallovedeniya, 117 - 122

TEXT: The authors investigated the paramagnetic susceptibility vs temperature curve of ferrochromium alloys containing 12.4, 24.5, 33,6 and 41.6 atomic % Cr, respectively. The alloys were smelted in an induction-type vacuum furnace. The ingots were homogenized for 50 hours at 1,200°C, and then forged and drawn to 2 mm in diameter with subsequent 3-hour annealing at 900°C to relieve the drawing stresses. The paramagnetic susceptibility vs temperature curves obtained proved that the tested alloys comply with the Curie-Weiss law. A number of formulae and a table are presented. The investigation results reveal that, if in changes of the state of the solid solution, magnitude n is changed in the same direction as

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Rating of the interatomic action in S/601/62/000/015/003/010
A004/A127

is the case with an increase in concentration of the second constituent, this will favor the "strengthening" of interatomic binding. There are 3 figures and 1 table.

SUBMITTED: March 10, 1961

Card 2/2

S/185/62/007/012/011/021
D234/D308

AUTHORS: Dekhtyar, I.Ya. and Polotnyuk, V.V.

TITLE: The change of coercive force after annealing deformed Ni alloys with additions of cerium, praseodymium and gadolinium

PERIODICAL: Ukrayins'kyy fizychnyy zhurnal, v. 7, no. 12, 1962, 1324 - 1333

TEXT: The concentration of Ce, Pr, Gd was 0.1 to 0.4 % by weight. Specimens (0.8 mm in diameter) were annealed in Ar at 1000°C for 2 hours, then subjected to torsional deformation up to nd/l = 0.7, and heated to 250° - 670°C at 10^{-3} mm Hg, after which the coercive force was measured. Conclusions: 1) Increase of Ce, Pr, Gd concentrations leads to a nearly linear increase of the coercive force, both after initial annealing and after deformation, with maximum variation in the case of 0.4 % admixtures (by about 15 % after deformation). 2) The rate of variation of the coercive force is not affected by admixtures up to 0.1 % but

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The change of coercive force ...

is considerably increased by larger admixtures. 3) X ray investigation of the alloy with 0.4 % Cd showed no recrystallization below 520°C, even on prolonged annealing. At 570°C recrystallization was observed 5 minutes after the beginning of annealing. For the low-temperature stage it is calculated that

$$\ln (1 - \Delta H_c/\Delta H_{c\,max}) = - \alpha N_d (AD\tau/kT)^{2/3} \quad (8)$$

and, for the high-temperature stage,

$$\Delta H_c/H_{c\,max} = (kT/\beta \sigma_{max}) \ln (1 + \tau/\tau_0) \quad (19)$$

Both relations are confirmed. There are 6 figures and 2 tables.

ASSOCIATION: Instytut metalofizyky AN URSR, Kyyiv (Institute of Metal Physics AS UkrSSR, Kiev)

SUBMITTED: May 23, 1962

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S/126/62/013/002/016/019
E039/E135

AUTHORS: Dekhtyar, I.Ya., Levina, D.A., and Mikhalenkov, V.S.

TITLE: Magnetic saturation of alloys of iron and nickel at high all sided pressures

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.2, 1962, 308-310

TEXT: The authors studied the effect of high all sided pressure on the magnetic saturation of nickel and of the alloys: Ni + 23.7 at% Mn; Fe + 36% Ni; Fe + 36% Ni + 1% Mo; Fe + 36% Ni + 2% Mo; Fe + 36% Ni + 3% Mo; Fe + 36% Ni + 4% Mo. High pressures were generated by the change of volume on solidification inside an improved design of thick walled high pressure bomb. Magnetic saturation could be measured, by a differential method, to an accuracy of ± 0.05%, in a field of 5000 oersted at room temperature. For all the investigated materials the magnetic saturation decreased linearly with increasing pressure over the range 1 to 10 000 atm (accuracy ± 30 atm). In the ordered alloy Ni + 23.7 at% Mn the change in magnetic saturation with pressure is reversible. This verifies

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that the degree of order is not changed over the pressure range investigated but that there is a change in the magnetic moment of the atoms on account of the decrease in distance between them at high pressures. The addition of 1% Mo to Fe + 36% Ni approximately halved the relative change in magnetic saturation, but further additions of Mo did not essentially change this value. The thermodynamic relations associated with these changes of magnetic saturation are given and discussed. It is concluded that further work is necessary in order to obtain a satisfactory explanation of the processes occurring.
There is 1 table.

ASSOCIATION: Institut metallofiziki AN UkrSSR
(Institute of Physics of Metals, AS UkrSSR)

SUBMITTED: April 21, 1961

DEKHTYAR, I.Ya.; MIKHALENKOV, V.S.; FEDCHENKO, R.G.

Evaluating the interaction between atoms in alloys at high temperatures. Issl.po zharopr.splav. 8:31-35 '62. (MIRA 16:6)

(Heat-resistant alloys—Magnetic properties)
(Electrons)

DEKHTYAR, I.Ya.; MADATOVA, E.G.

Behavior of defects in crystal structures during heat treatment. Issl.po zharopr.splav. 8:36-41 '62. (MIRA 16:6)
(Metal crystal—Defects) (Annealing of metals)

DEKHTYAR, I.Ya.; MIKHALENKOV, V.S.; FEDOCHENKO, R.G.

Evaluating the interatomic interation in iron-chromium alloys at high temperature. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.15: 117-122 '62. (MIRA 15:12)
(Iron-chromium alloys--Thermal properties) (Crystal lattices)

S/810/62/000/000/002/013

AUTHORS: Dekhtyar, I. Ya., Madatova, E. G.

TITLE: Effect of cyclic heat treatments on the volumetric properties of metals and alloys.

SOURCE: Metallovedeniye i termicheskaya obrabotka; materialy konferentsii po metallovedeniyu i termicheskoy obrabotke, gost. v g. Odesse v 1960 g. Moscow, Metallurgizdat, 1962, 29-34.

TEXT: The paper describes an experimental investigation of the mechanism of elongation of a metallic body in one direction and contraction in another direction upon multiple high-temperature quenching. More specifically, the investigation comprised: (a) The effect of multiple quench (MQ) on the volumetric changes of metals, and (b) the effect of MQ on the decomposition rate (DR) of supersaturated solid solutions (SSS). Effect of MQ on volume changes: Wire specimens 0.5-0.9 mm diam and strip 4 mm wide and 0.1-0.2 mm thick were employed. Specimen length: 100-150 mm. Pure (99.99%) metals, namely, Ag, Au, Pt, and 50:50 alloys of Cu and Au, α brass, and α+β brass, were tested. Quench (Q) temperatures (T) 500-1,000°C. For a given number of T cycles (e. g., 1,000) the empirical elongation equation, $\epsilon = A \exp(-U/kT)$, appears valid (A and U are certain material-

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dependent constants). The macrodeformation thus obtained appears to be the summation or accumulation of the microdeformations derived from each single T cycle, which may be attributable to an excess concentration of vacancies obtained after each Q and the character of their motion as a result of interaction with dislocations. It is found that the value of the constant U is indeed close to that of the energy of vacancy formation. Effect of MQ on the DR of SSS: Several Ag- and Cu-based alloys with various admixtures were prepared. Photos and test-data graphs are shown for an Ag-Cu alloy containing 6 wt. % Cu. This alloy was qualitatively representative of others tested. A single Q produced intense grain growth, thickening of grain boundaries, and appearance of porosity. The T and time dependance of hardness (H) is taken as a representative characteristic, and it is found that MQ specimens attain their H maximum upon a change in anneal T more rapidly than a SQ specimen, even though the value of the maximum H is lower than in the SQ specimen, a phenomenon that indicates an acceleration of the decomposition (D) of the SSS and also an acceleration of the process of coagulation of the precipitating particles of the new phase. X-ray-diffraction studies, in agreement with microstructural and H investigations, show that during the aging of a specimen the second phase appears much more rapidly in MQ specimens than in SQ specimens. In summary, the effect of MQ on the volumetric changes in Ag, Au, and Pt point to the conclusion that in slender specimens MQ leads to a considerable dislocation density, attended

by great internal stresses in the solid-solution crystals, and since the D of the solid solutions is a diffusion process, the presence of internal stresses must afford an acceleration of the D process as observed in the present investigation. There is no detailed theory of the D of SSS on the basis of dislocation concepts at this time. Further investigations and accumulation of additional data are required to clarify the function of dislocations and other defects of the crystalline structure in the process of the D of the SSS. There are 7 figures and 2 Russian-language Soviet references.

ASSOCIATION: Institut metallofiziki, AN SSSR. (Institute of Metals Physics, Academy of Sciences, USSR).

S/601/62/000/016/007/029
E193/E383

AUTHORS: Gertsriken, S.D. (Deceased), Dekhtyar, I.Ya. and Kumok, L.M.

TITLE: A study of the behavior of defects formed in chromium and niobium during filing

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut metalofyzyky. Sbornik nauchnykh rabot. no. 16. Kiyev, 1962. Voprosy fiziki metallov i metallovedeniya. 55 - 58

TEXT: Plastically deformed specimens of 99.99% pure Nb and 99.9% pure Cr were obtained by filing with various types of files, the degree of deformation varying with the size of the filings which were separated into fractions by sieving. X-ray diffraction analysis was used to determine the effect of the size of the filings (i.e. the degree of deformation) on the block dimensions D, the magnitude of the stresses of the second type $\Delta a/a$ and the dislocation density N in the metals studied. It was shown that with decreasing size of the particles D decreased and $\Delta a/a$ increased. At equal particle size the degree of deformation was higher in Nb,

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S/601/62/000/016/007/029
E193/E583

A study of the ....

the block dimensions reaching a value of 2.3×10^{-6} cm in the 1 - 18 μ fraction in the case of Nb, and in the 1 - 35 μ fraction in the case of Cr. N increased with decreasing particle size, reaching saturation in filings of the 1 - 18 μ fraction. There are 1 figure and 2 tables.

SUBMITTED: January 26, 1962

Card 2/2

GERTSRIKEN, S.D. [deceased]; DEKHTYAR, I.Ya.; KUMOK, L.M.

Studying the behavior of defects occurring in chromium and niobium during their deformation by filing. Sbor. nauch. rab. Inst.metallofiz. AN URSR no.16:45-58 '62. (MIRA 16:5)
(Chromium--Metallography) (Niobium--Metallography)

S/601/62/000/016/006/029
E193/E383

AUTHORS: Dekhtyar, I.Ya. and Shalayev, A.M.

TITLE: The effect of γ-radiation on some properties of deformed metals

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut metalofyzyky. Sbornik nauchnykh rabot. no. 16. Kiyev, 1962. Voprosy fiziki metallov i metallovedeniya. 48 - 54

TEXT: The effect of γ-radiation on the microstresses and concentration gradients in Fe-Cr (8, 10, 12% Cr), Fe-25 at.% Al and steel У8 (U8) specimens was studied. The test pieces, in the form of strip 30 - 35 mm long and 0.3 mm thick, were homogenized and then bent over a 60 mm radius in a suitably-shaped vice. The bending operation was carried out at 720 °C on Fe-Cr alloys, at 620 and 1200 °C on the Fe-Al alloy and at 850 °C on steel U8; after bending the specimens were held at the temperature for 1 - 1.5 min and then water-quenched. The radius r_o of the specimen was determined, after removal from the vice, from the depth of the arc curvature. The specimens, either free or clamped

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in a flat vice, were then bombarded with γ-radiation and the resultant changes $\Delta\sigma$ in the internal microstresses were calculated from the formula:

$$\Delta\sigma = EZ\left(\frac{r_1 - r_o}{r_1 r_o}\right)$$

where E is the Young modulus, Z the half-thickness of the specimen and r_i its radius after the irradiation treatment. For comparison, $\Delta\sigma$ was also determined in specimens held in a flat vice but not irradiated. Typical results are reproduced in Fig. 1, where $\Delta\sigma$ (kg/mm^2) is plotted against the γ-radiation dose (γ/ cm^2), the various curves relating to the following Fe-Al alloy specimens: 1 - bent at 620 °C and irradiated in a flat vice; 2 - bent at 620 °C and aged in a flat vice without irradiation; 3 - bent at 620 °C and irradiated without clamping; 4 - bent at 1200 °C and irradiated in a flat vice. The following explanation was postulated of the γ-radiation-induced relaxation of internal microstresses observed in the course of the present investigation.

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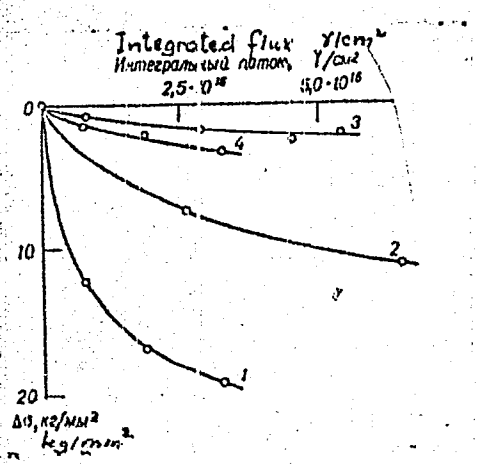
Fraenckel pairs or more complex (dislocation-type) defects are formed in the metal as a result of γ-radiation. These defects have increased mobility at the moment of their formation and migrate to the microstress regions, annihilating defects formed during the preliminary deformation and, consequently, leading to relaxation of internal stresses. In general, it can be stated that γ-radiation reacts with metals and induces in them processes that lead to the formation of a structure more approaching the state of equilibrium. Similar results were obtained during studies of the effect of γ-radiation on the coercive force of nickel wires preliminarily deformed in torsion; the higher the degree of preliminary deformation, the greater was the γ-radiation-induced decrease in the coercive force of the test pieces. An additional, more direct proof of the γ-radiation-induced increase in the mobility of atoms was obtained in the following manner. Specimens of a 27% Mn-Ni alloy were vacuum-annealed at 1 000 C for 1 h. A concentration gradient was formed in the surface layer as a result of volatilization of Mn. Measurements of the width of the (311) and (200) diffractions at half-height of the maximum, before and

The effect of ....

after γ-irradiation, showed that this treatment brought about a considerable decrease in the Mn-concentration gradient.
There are 5 figures.

SUBMITTED: December 30, 1961

Fig. 1:



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S/601/62/000/016/009/029
E111/E451

AUTHORS: Dekhtyar, I.Ya., Madatova, E.G.

TITLE: Dilatometric investigations on nickel and silver, quenched from high temperatures

SOURCE: Akademiya nauk Ukrayins'koyi RSR. Instytut metalfyzyky. Sbornik nauchnykh rabot. no.16. Kiev, 1962. Voprosy fiziki metallov i metallovedeniya. 63-67

TEXT: Small dimensional changes were determined by measuring the change in the deflection of a catenary of the test material in the form of a foil 0.2 to 0.3 mm thick and 120 to 150 mm long. This enabled relative changes in volume of 10^{-5} to 10^{-6} to be determined. The ends of the strip were attached to a bar of the test material, which was either pure nickel, the foil being quenched from 900 to 1100°C, or pure silver, quenched from 700 to 900°C. The foil specimens were then annealed at a low temperature which left in them only loops of fixed dislocations. The volume changes observed in the tests therefore corresponded to the elimination of these loops. The calculated density of the loops was 0.92×10^{-15}, 3.13×10^{-15} and 8.47×10^{-15} for nickel at 900, 1000 and 1100°C respectively, the corresponding calculated loop

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S/601/62/000/016/009/029
B111/E451

diameters being 1120, 1090 and 880 Å; corresponding values for silver were 1.51, 3.88 and 5.5 x 10^{-16} at temperatures of 700, 800 and 900°C with loop diameters of 1770, 1470 and 1280 Å. There are 2 tables.

SUBMITTED: January 5, 1962

Card 2/2

DEKHTYAR, I.Ya.; MADATOVA, E.G.

Studying the rate of remagnetization during the repeated hardening of iron-silicon alloys. Sbor. nauch. rab. Inst.metallofiz. AN URSR no.16:68-70 '62. (MIRA 16:5)
(Iron-silicon alloys--Hardening) (Magnetization)

S/048/62/026/002/019/032
B106/B112

AUTHORS: Dekhtyar, I. Ya., and Madatova, E. G.

TITLE: Change of coercive force on tempering of hardened nickel

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 2, 1962, 270-273

TEXT: The connection between magnetic (domain) and dislocation structure of ferromagnetics was investigated. For this purpose the authors studied the change in coercive force H_c on low temperature tempering of pure nickel which has been hardened by quenching from 900, 1000, 1100°C. The specimens were 70 mm long and 0.4 mm thick wires. After hardening they were tempered at 100°C for 18 hrs. H_c was measured every hour (Fig. 1). Calculation of the coercive force as depending on the time of low temperature tempering was in good agreement with the experiments. According to I. Ya. Dekhtyar and E. G. Madatova (Ref. 1: Izv. vyssh uchebn. zaved. Fizika, no. 1, 63 (1961)), the coercive force becomes practically stable after sufficiently long tempering at 100°C of high

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temperature hardened nickel. This behavior occurs as soon as practically all existing point defects have migrated to the periphery of the prismatic deformation loops and the regions of remagnetization are growing no longer. Nickel specimens in this state were subsequently tempered at high temperature (700°C) until H_c became equal to H_o. Coercive force was measured every now and then during the tempering (Fig. 1). It decreases exponentially with proceeding time of tempering according to the law $H_c = H_o + \Delta H_m \exp(-\alpha t)$. The change in free energy of the system was considered taking into account the kinetics of formation and growth of nuclei of the "excess" phase. "Excess" phase are the loops of prismatic dislocations which after long low temperature tempering reach certain dimensions. The equations

$$dr/dt = -D(T)\left[\frac{1}{r} - \frac{1}{r_{cr}}\right]$$

for the rate of coalescence of the dislocation loops (Ref. 6, see below) and $H_c(\omega_1^*) = c_3 \pi d_1 N_S \langle \omega_1^* \rangle^2 \bar{r}^2 / L^3 I_S$ for the dependence of the coercive for -

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on the size of the dislocation loops (Ref. 1) were made the starting points, r - size of the dislocation loops, r_{cr} - critical size at the respective temperature of experiment (dislocation loop with $r < r_{cr}$ vanish, loops with $r > r_{cr}$ will grow); D(T) - function depending on temperature in the same way as the rate of autodiffusion, T - temperature of tempering, σ_1 - density of magnetic poles on the surface of the separation "plate", d_1 - thickness of the "plate" (in the case in question nearly equal to the vacancy diameter d_v), N_S - number of dislocation loops in a crystal of size L, $\bar{r}$ - mean size of the loops, I_S - saturation magnetization. The calculations yielded $\Delta H_{max} = Ar_0 n_{S_0}$, where $A = \alpha_3 \pi d_1 \sigma_1^2 / L^3 I_S$; $n_{S_0} = n_S \exp(\beta t)$; $n_S = 2\pi \bar{r} N_S / d_v$; $r_0 = \bar{r} \exp(\frac{1}{4} t)$. This expression means that the maximum change in coercive force on tempering is determined by the maximum radius of the loops with $r < r_{cr}$ and by the initial number of

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all existing flows on the loops of the prismatic dislocations. There are 3 figures and 7 references: 2 Soviet and 5 non-Soviet. The three most recent references to English-language publications read as follows: Kimura H., Maddin R., Kuhlman-Wilsdorf D., Acta metallurgica, 7, no. 3, 145 (1959); Ref. 6: Silcox J., Whelan M. J., Philos. Mag., 5, no. 49, 1 (1960); Johnson C. A., Philos. Mag., 5, no. 60, 1255 (1960).

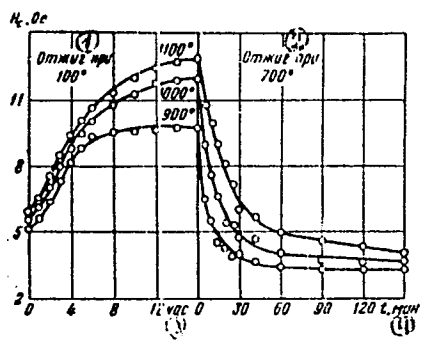

Fig. 1. Dependence of coercive force of Ni on glowing time.

Legend: (1) glowing at 100°C; (2) glowing at 700°C; (3) hrs; (4) min.

S/048/62/026/002/020/032
B106/B104

AUTHORS: Dekhtyar, I. Ya., and Shalayev, A. M.

TITLE: Effect of lattice defects on the displacement velocity of the domain boundaries

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v 26 no. 2, 1962, 273-276

TEXT: The effect of lattice defects on the rate of magnetization of pure nickel (99.99 % Ni), of an Ni-Cu alloy (30 % Cu), and of an Fe-Si alloy (4 % Si) was studied. The specimens were 50 mm long and 3 mm thick polycrystalline cylinders. As the specimens were no single crystals with simple domain structure, the authors did not obtain the velocity of displacement of the domain boundaries but only the rate of magnetization of the specimens which is proportional to the velocity of displacement. Two coils were wound around each specimen, one for magnetization of the specimen and the other for measurement of the induction appearing when the field is applied to the specimen. The curves of the currents induced in the coil were recorded on a film by a loop oscillograph. All specimens

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Effect of lattice defects on...

were examined after tempering or after plastic deformation by twisting or after radioactive irradiation. The latter was done in two ways: either by gammas from a Co^{60} preparation or in a reactor with filtration of the thermal neutrons by a cadmium filter. The thermal neutrons cause a flux of gamma quanta which act upon the specimen in addition to the fast neutrons. Plastic deformation causes dislocations in the material. Irradiation with gamma quanta causes paired Frenkel' defects and complex dislocations. Also the fast neutrons cause dislocations. Therefore, in the described treatment of the specimens imperfections will arise which are a resistance to the migration of the domain boundaries. Fig. 1 shows the dependence of magnetization rate of Ni-Cu specimens on the applied field (for the different pretreatments). The magnetization rate was found to decrease with increasing degree of plastic deformation. Similar conditions were also found in specimens of Ni and Fe-Si alloy. Fig. 3 shows the effect of the irradiation dose on the magnetization rate of Ni and Fe-Si alloy. The decrease in magnetization rate can be explained by the slowing down of domain boundary migration by the defects arising on plastic deformation or radioactive irradiation. Recovery can be explained either by radiation annealing of the defects with increasing radiation dose, or by a qualitative

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redistribution of the imperfections in the material with increasing radiation dose. There are 3 figures and 7 references: 1 Soviet and 6 non-Soviet. The three most recent references to English-language publications read as follows: DeBlois R. W., J. Appl. Phys., 29, 459 (1958); Galt J. K., Phys. Rev., 85, 4 (1952); Rudbell D. S., Bean C. P., J. Appl. Phys., 26, 11, 1318 (1955).

Fig. 1. Magnetization rate of Ni-Cu versus field strength.
Legend: (1) deformation 0.15; (2) deformation 0.375 (deformations in nd/l units; n-number of turns on twisting, l - length, d - diameter of specimen.); (3) annealed specimens; (4) Co^{60}-gamma irradiated specimens (10^6 r); (5) specimens irradiated in a reactor ($5 \cdot 10^7$ r); (6) idem, $1.5 \cdot 10^8$ r); (7) idem, $2.5 \cdot 10^8$ r); ordinates - V, m/sec.

Fig. 3. Magnetization rate versus radiation dose for specimens of nickel (1 - 3) and Fe-Si (4 - 7).
Legend: (1), (4) H = 40 oe; (2), (6) H = 24 oe; (3), (7) H = 20 oe; (5) H = 30 oe. Ordinates - V, m/sec; abscissae - radiation dose, r.

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144,2002

S/020/62/144/004/012/024
B125/B108

AUTHORS: Dekhtyar, I. Ya., and Levina, D. A.

TITLE: The influence of pressure on the atomic magnetic moments and the parameter of exchange interaction in some iron alloys

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 144, no, 4, 1962, 770-773

TEXT: In order to avoid the experimental difficulties of directly investigating the influence of pressure upon the atomic magnetic moments and upon the exchange interaction in some iron alloys the authors examined the temperature dependence $I_s = I_o(1 - f(T/\Theta))$ (1) of magnetic saturation. With $\partial I_s/\partial p = -\partial h/\partial H$, (1) leads to the equation $-\partial\omega/\partial H = I_s(\partial m_o/m_o\partial p) - T(\partial I_s/\partial T)(\partial \bar{A}/\bar{A}\partial p)$ valid in the range of paraprocesses. I_o is the magnetic saturation at 0^oK, $\Theta = z\bar{A}/2k$ is the Curie temperature, z is the coordination number, $\bar{A}$ is the parameter of exchange interaction, ω is the volume magnetostriction. Measurement of the mag-

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netostriction of the paraprocess at two different temperatures makes it possible to determine $\partial m_o/m_o\partial p$ and $\partial\bar{A}/\bar{A}\partial p$. ω of forged and annealed samples of Fe + 31% Ni was measured. It increases linearly with increasing field strength; calculation with measured data gave $(\partial I_s/\partial T)_{298^\circ K}$ = -5.55 oe/deg and $(\partial I_s/\partial T)_{347^\circ K}$ = - 8.72 oe/deg. Fig. 2 shows the dependence of $-\partial m_o/m_o\partial p$ and $-\partial\bar{A}/\bar{A}\partial p$ on the nickel concentration. The crosses mark the experimental points found by measuring the atomic moments at low temperatures. $\partial m_o/m_o\partial p$ has a maximum at ~34% Ni. For $p = 10^4$ atm, the relative variation $\Delta\bar{\kappa}/\kappa = (1 + (1/\bar{q}))\Delta\bar{m}/m_{alloy}$ of the s-d exchange interaction parameter amounts to respectively 0.17; 0.35; 0.17; and 0.04 for 31; 34.7; 38; and 44.9 % of Ni in the alloy. $\bar{q}$ is the space factor. The magnetic moment changes slightly with changing concentration. The atomic magnetic moments and the parameter of exchange interaction of partially ordered alloys are less influenced by pressure than in the case of non-ordered alloys. There are 2 figures and 1 table.

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The influence of pressure ...

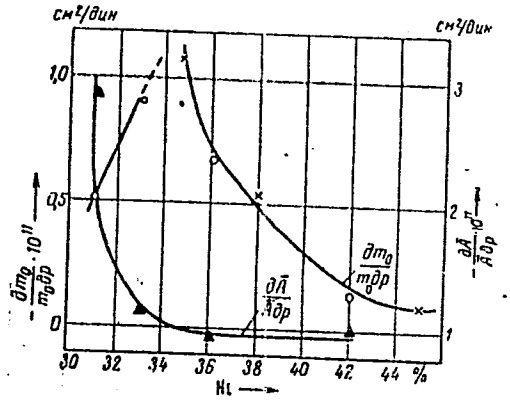
S/020/62/144/004/012/024
B125/B108

ASSOCIATION: Institut metallofiziki Akademii nauk USSR (Institute of Metal Physics of the Academy of Sciences UkrSSR)

PRESENTED: January 4, 1962, by G. V. Kurdyumov, Academician

SUBMITTED: January 2, 1962

Fig. 2.



Card 3/3

S/020/62/147/006/014/034
B104/B180

AUTHORS: Dekhtyar, I. Ya., Litovchenko, S. G., Mikhalenkov, V. S.

TITLE: Positron-electron annihilation in ordering alloys

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 147, no. 6, 1962, 1332-1335

TEXT: Methods developed in recent years are here used for the first time to study the variation in the maximum momenta p_m of conduction electrons on the ordering of the alloys Ni_3Mn, Cu_3Au and CuAu. The alloys differ both structurally, and in the elastic stresses of the lattice, which are due to the different atomic dimensions. For ordered-state CuAu p_m is $8.0 \cdot 10^{-3}$ mc, for disordered, $8.9 \cdot 10^{-3}$ mc. Similar results were obtained with Ni_3Mn, but with Cu_3Au there is no difference in p_m for the ordered or disordered states. N(p) the momentum distribution of conduction electrons in the Brillouin zone is plotted from the angular dependence of the annihilation photons according to A. T. Stewart (Can. J. Phys., 35, 168 (1957)) (Fig. 2). The change in N(p) on ordering primarily indicates

Positron-electron annihilation ...

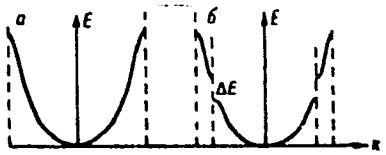
compression of the energy levels on formation of the energy gap ΔE (separation of the Brillouin zone into two halves). Further, as the total number of occupied energy levels remains constant, $N_{max}(p)$ must be larger for the ordered than the disordered state. The variation in the mean kinetic energy of electrons due to change in the degree of long-range order is investigated in a manner similar to that employed by H. Jones (Proc. Phys. Soc., 49, 243 (1937)) for the variation in Fermi energy on the α- and β-phase stabilization of brass. It is found that p_m diminishes on ordering. There are 2 figures.

ASSOCIATION: Institut metallofiziki Akademii nauk USSR (Institute of Physics of Metals of the Academy of Sciences UkrSSR)

PRESENTED: June 8, 1962, by G. V. Kurdyumov, Academician

SUBMITTED: June 4, 1962

Fig. 2



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BEKHTYAR, I. Ya.; LITOVCHENKO, S. G.; MIKHALENKOV, V. S.

Electron-positron annihilation in ordered alloys. Dokl. AN SSSR 147 no.6:1332-1335 D '62. (MIRA 16:1)

1. Institut metallofiziki AN UkrSSR. Predstavleno akademikom G. V. Kurdyumovym.

(Copper-gold alloys) (Nickel-manganese alloys)
(Electrons)

S/810/62/000/000/009/013

AUTHORS: Dekhtyar, I. Ya., Shalayev, A. M.

TITLE: Effect of γ-radiation on the relaxation of internal stresses in iron-based alloys.

SOURCE: Metallovedeniye i termicheskaya obrabotka; materialy konferentsii po metallovedeniyu i termicheskoy obrabotke, sost. v g. Odesse v 1960 g. Moscow, Metallurgizdat, 1962, 240-245.

TEXT: The paper reports the results of an experimental investigation which extends concepts developed in antecedent literature, including Thompson, D., Homes, D., J. Phys. Chem. Solids, v.1, no.4, 1957, 275-278, regarding changes in physical properties of metals under γ-radiation, for example, increase in Young modulus (ME) and the coercive force. The present investigation studied the relaxation (R) of internal stresses (IS) in plastically deformed specimens under γ-quantum radiation. Specimens of Fe-Al (25% at. Al), Fe-Cr (8, 10, and 12% Cr), and steel 8 (U8) were tested. Equilibrium structure in Fe-Cr specimens was attained by a 50-hr anneal at 1,170°C. Strip 30-35 mm long, 0.3 mm thick, was bent to a 60-mm radius at high temperature. The Fe-Cr specimens were thus bent at 720°, those of Fe-Al at 620 and 1,200°, and those of steel U8 at 850°, and were

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then cooled in water. The holding times were reduced to a minimum to avoid any noticeable recrystallization. Upon bending and subsequent quench (Q) a certain stressed state remains fixed. The stress relaxation was observed with reference to the change in bending deflection and was measured with a comparator accurate to 10 μ. A Co^{60} source with an activity of 140 curie provided the radiation. Flux through the specimen: $1.5 \cdot 10^{11}$ γ/cm^2·sec. The results are tabulated. It was assumed, for the purposes of the present investigation, that the ME does not vary under γ-radiation (contrary to existing evidence). Fe-Al alloy specimens bent at 620° with subsequent water cooling were clamped in a flat vise, and some of the specimens were exposed to γ-radiation at 20°C. Both specimen batches underwent relaxation, but the tests showed that the γ-irradiated specimens experienced a greater degree of IS relaxation and the rate of IS relaxation was greater (graph). It is hypothesized that the defects produced by the γ-radiation have sufficient mobility to migrate to points at which stresses exist and to annihilate with defects arising during the plastic deformation and Q. Such a mechanism would explain the IS relaxation accomplished by the γ-radiation. Assuming that for the materials tested, the effective scattering cross-section for γ-quanta is approximately equal to $0.5 \cdot 10^{-24}$ cm^2 and the maximum γ-quanta flux equals $5.4 \cdot 10^{16}$ γ/cm^2, then the number of displacements per unit volume will approximate $2.3 \cdot 10^{15}$ cm^{-3}.

APPROVED FOR RELEASE: 06/12/2000 CIA-RDP86-00513R000309930001-6"

This number of displacements formed corresponds to a specified % of change IS. Thus, it is concluded that radiation interacting with a metal will initiate in it stress-relaxation processes and that, since the number of defects formed increases steeply with the energy of the γ-quanta, the effect of γ-radiation in IS relaxation will also increase in intensity. There are 3 figures, 1 table, and 4 references (3 Russian-language Soviet and the 1 English-language US reference cited in the text).

ASSOCIATION: Institut metallofiziki AN USSR (Institute of Metals Physics, AS UkrSSR).

DEKHTYAR, I.Ya.; MADATOVA, E.G.

Changes in the coercive force during high-temperature annealing of hardening nickel. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.15: 123-130 '62. (MIRA 15:12)
(Nickel—Magnetic properties) (Metals, Effect of temperature on)

DUBININ, Aleksandr Dmitriyevich; DEKHTYAR, I.Ya., doktor fiziko-matem. nauk, prof., retsenzent; PONYAKO, N.F., doktor fiz.-matem. nauk, prof., red.; SINGOYEVSKIY, K.V., red.; GORNOSTAYPOL'SKAYA, M.S., tekhn. red.

[Theory of the energy friction and wear of machine parts] Energetika treniia i iznosa detalei mashin. Moskva, Mashgiz, 1963. 135 p. (MIRA 16:5)
(Friction) (Mechanical wear)

FRANTSEVICH, Ivan Nikitich, doktor khim. nauk; VOYTOVICH, Raisa Fominichna, kand. khim. nauk; LAVRENKO, Vladimir Alekseyevich, kand. khim. nauk; DEKHTYAR, I.Ya., prof., doktor tekhn. nauk, retsenzent; CHUMACHENKO, T.I., red.izd-va; BEREZOVYY, V.N., tekhn. red.

[High temperature oxidation of metals and alloys] Vysokotemperaturnoe okislenie metallov i splavov. Kiev, Gos.izd-vo tekhn. lit-ry USSR, 1963. 321 p. (MIRA 16:9)
(Oxidation) (Metals at high temperatures)

AM4017086 BOOK EXPLOITATION S/

Gertsriken, S. D.; Dekhtyar, I. Ya.; Krivoglaz, M. A.; Larikov, L. N.; Ly*sak, L. I.; Nesterenko, Ye. G.; Novikov, N. N.; Sosnina, Ye. I.; Slyusar, R. F.; Tikhonov, L. V.; Trefilov, V. I.; Chuistov, K. V.

Physical bases of the strength and ductility of metals (Fizicheskiye osnovy* prochnosti i plastichnosti metallov) Moscow, Metallurgizdat, 1963. 321 p. illus., biblio. Errata slip inserted. 4250 copies printed. Editor of the publishing house: Ye. N. Berlin; Technical editor: L. V. Dobuzhinskaya; Bindery artist: Yu. M. Vashchenko

TOPIC TAGS: strength of metals, ductility, crystal lattice, dislocations, metal failure, strain hardening, solid solution, microstress, lattice defect, plastic strain, relaxation, polygonization, recrystallization, grain growth

PURPOSE AND COVERAGE: This collection of articles is intended for scientific personnel and for engineers and metals physicists; it also may be useful to students at metallurgical and machine-building vuzes. The results of study of crystal-lattice imperfections and the dislocation theory of metal failure are

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AM4017086

presented. Contemporary concepts of the nature and mechanism of different weakening processes in metals are expounded, as well as present-day thinking concerning the effect of impurities on the kinetics of the weakening processes. The articles in this collection are principally the original results of research performed in recent years at the Institut Metallofiziki AN USSR.

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3. Behavior of defects in the crystal structure in metals during heat treatment and their effect on physical properties (I. Ya. Dekhtyar) - - 71
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1. Relaxation, polygonization, recrystallization, and grain growth (L. N. Larikov) -- 255

SUB CODE: ML, AP SUBMITTED: 23Aug63 NR REF SOV: 253

OTHER: 463 DATE ACQ: 17Jan64

Card 3/3

DEKHTYAR, I.Ya.; LITOVCHENKO, S.G.; MIKHALENKOV, V.S.

Annihilation of positrons and electrons in iron-silicon alloys. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.17:50-54 '63. (MIRA 17:3)

DEKHTYAR, I.Ya.; POLOTNYUK, V.V.

Changes in the coercive force during the annealing of a ferromagnetic material. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.17:55-59 '63. (MIRA 17:3)

DEKHTIAR, I.Ya.; LEVINA, D.A.

ΔI_s-effect in plastic deformations of ferromagnetics. Fiz. tver tela 5 no.9:2719-2722 S '63. (MIRA 16:10)

1. Institut metallofiziki AN UkrSSR, Kiyev.

DEKHTYAR I.Ya.; MIKHALENKOV, V.S.

Effect of defects of the crystal lattice on the susceptibility of paramagnetic metals. Fiz. tver. tela 5 no.10:2997-3002 O '63. (MIRA 16:11)

1. Institut metallofiziki AN UkrSSR, Kiyev.

DEKHTYAR, I.Ya.; POLOTNYUK, V.V.

Changes in the density of dislocations during the annealing of a deformed metal. Fiz. met. i metalloved. 16 no.6:929-931 D '63. (MIRA 17:2)

1. Institut metallofiziki AN UkrSSR.

L 22506-65 EWT(m)/EWA(d)/EWP(t)/EWP(k)/EWP(b) Pf-4/Pad/ ASD(a)-5/ASD(m)-3/
AS(mp)-2/IJP(c) JD/JW/HW/HLK

ACCESSION NR: AT4046815 S/0000/64/010/000/0050/0053

AUTHOR: Bekhtyar, I. Ya.; Madatova, E. G.

TITLE: The effect of cyclic heating on the irreversible deformation of pure metals

SOURCE: AN SSSR. Nauchny*y sovet po probleme zharoprochny*kh splavov. Issledovaniya staley i splavov (Studies on steels and alloys). Moscow, Izd-vo Nauka, 1964, 50-53

TOPIC TAGS: metal deformation, thermocyclic treatment, bending stress, irreversible deformation, nickel wire deformation, hardening temperature, nickel electrical resistance, activation energy

ABSTRACT: The deformation of metals during variable heat treatment was investigated on both bulky and thin wire samples. Available data for various metals show that, with a constant number of thermocycles, the relative change in length is little affected by sample diameter, and for bulky samples does not exceed the value obtained for very thin samples from electrical resistance measurements. Thermocyclic treatment data were obtained for nickel from measurements of the change in deflection of a nickel wire fastened between 2 points connected to electrodes. The dependence of the change in deflection on the number of thermocycles and the hardening temperature was shown, and the vacancy formation energy E_v was determined. With equal hardening conditions, the relative change in length

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ACCESSION NR: AT4046815

for a fixed wire is significantly greater than for a free sample. The interaction of vacancies with dislocations causes deformation which is accumulated during repeated heating and cooling cycles. The functional bond between plastic deformation and thermal hardening acquires a more general character when the data for wire samples are examined. During thermocyclic treatment, the laws of deformation indicate the essential role of vacancies which, by reacting with dislocations, determine the mechanism of the investigated process. Continuous references are made to the work and conclusions of earlier published papers. Orig. art. has: 1 table, 3 figures and 4 formulas.

ASSOCIATION: None

SUBMITTED: 16Jun64 ENCL: 00 SUB CODE: MM

NO REF SOV: 014 OTHER: 003

Cold 2/2

ACCESSION NR: AT4042830 S/2601/64/000/018/0026/0031

AUTHOR: Dekhtyar, I. Ya(Doctor of technical sciences); Shalayev, A. M.

TITLE: Increase of atomic mobility in alloys as a result of gamma irradiation

SOURCE: AN UkrSSR. Institut metallofiziki. Sbornik nauchny*kh rabot, no. 18, 1964. Voprosy* fiziki metallov i metallovedeniya (Problems in the physics of metals and physical metallurgy), 26-31

TOPIC TAGS: atomic mobility, nickel manganese alloy, alloy electrical resistance, manganese concentration gradient, gamma irradiation, radiation dosage effect, alloy conductivity, Gamma ray

ABSTRACT: Samples (100 x 1 x 0.035 mm) of a Ni alloy containing Mn (10 at.%) were annealed 1 hr. at 1000C (to produce a Mn concentration gradient on the sample surface by high temperature vacuum evaporation) and irradiated (Co^{60} source, $5.9 \cdot 10^{13}$ sec^{-1}) in doses of $1.08 \cdot 10^{4}$ or $2.44 \cdot 10^{4}$ curie/kg at a rate of $3.23 \cdot 10^{-2}$ curie/kg·sec. Electrical resistance was measured (temperature constant to ± 0.02C, measurement error ± 0.05%)

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ACCESSION NR: AT4042830

to verify the assumption that changes in the physical properties of irradiated non-equilibrium systems are related in part to an increase in atomic mobility. The results obtained (0.4731, 0.4743 and 0.4750 — all $\pm 2.10 \cdot 10^{-4}$ — ohms for the initial state, small and large radiation dose, respectively) indicate an almost linear increase in resistivity with dosage. Samples without a concentration gradient did not exhibit a similar variation in electrical resistance when irradiated. Analysis indicates that the net effect of an increase in atomic mobility during irradiation and the formation of an excess defect concentration is equivalent to an effective increase in temperature. Orig. art. has: 14 equations and 1 graph.

ASSOCIATION: Institut metallofiziki AN UkrSSR (Metallophysics Institute, AN UkrSSR)

SUBMITTED: 18Mar63 ENCL: 00

SUB CODE: MM, NP NO REF SOV: 005 OTHER: 004

Card 2/2

DEKHTYAR, I.Ya.; POLOTNYUK, V.V.

Changes of dislocation density during the annealing of deformed metal. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.18:32-34 '64

Changes in the rate of magnetic polatiry reversal in nickel during annealing following deformation and hardening. Ibid.: 206-211

DEKHTYAR, I.Ya.; LEVINA, D.A.

Effect of plastic deformation on the magnetization saturation of ferromagnetic materials. Sbor. nauch. rab. Inst. metallofiz. AN URSR no.18:189-197 '64

L 8830-65 EWT(m)/T/EWP(q)/EWP(b)/EWA(m)-2 AS(mp)-2/ASD(a)-5/RAEM(a)/
AFWL/AFMDC/SSD/ESD(gs)/ESD(t)/RAEM(t) JD/JG

ACCESSION NR: AT4042842 S/2601/64/000/018/0198/0201

AUTHOR: Dekhtyar, I. Ya.; Litovchenko, S. G.; Mikhalenkov, V. S.

TITLE: Annihilation of positrons by electrons in gadolinium

SOURCE: AN UkrSSR. Institut metallofiziki. Sbornik nauchnykh rabot, no. 18, 1964. Voprosy* fiziki metallov i metallovedeniya (Problems in the physics of metal and physical metallurgy), 198-201

TOPIC TAGS: gadolinium, transition element, positron, electron, positron annihilation, gamma radiation, gamma ray distribution, antiferromagnetism, paramagnetism, Curie point, electron spin, spin cluster, Fermi boundary

ABSTRACT: On the basis of previous work, the transition from the antiferromagnetic to the paramagnetic state, which is accompanied by a change in the density of electron states, would be expected to have a definite effect on the form of the angular distribution of the γ-quanta arising during the annihilation of positrons by electrons. The present authors, therefore, studied the annihilation of positrons by electrons in 99.8% pure polycrystalline gadolinium during transition through the Curie point (289K). A comparison of the angular distribution of the γ-quanta obtained at 11 and 20C, corresponding to the ferromagnetic and

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ACCESSION NR: AT4042842

paramagnetic states, respectively, showed that the density of states at the Fermi boundary increases by about 15% on passage through the Curie point (see Fig. 1 of the Enclosure). The agreement between these findings and the changes in certain other physical properties of gadolinium during magnetic transformation indicates that all these effects are due to a change in the state of the electrons resulting from the change in the character of spin ordering at the Curie point; below this point, there is distant ordering of parallel spins, while above it there is close ordering, resulting in spin clusters. It is pointed out, however, that detailed analysis of these effects is made difficult by the contribution of the lower electron levels to the γ-spectrum of the transition elements. Orig. art. has: 2 figures.

ASSOCIATION: Institut metallofiziki AN UkrSSR (Institute of the Physics of Metals, AN UkrSSR)

SUBMITTED: 14Mar63 ATD PRESS: 3106 ENCL: 01

SUB CODE: NP, MM NO REF SOV: 004 OTHER: 006

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L 8830-65

ACCESSION NR: AT4042842

ENCLOSURE: 01

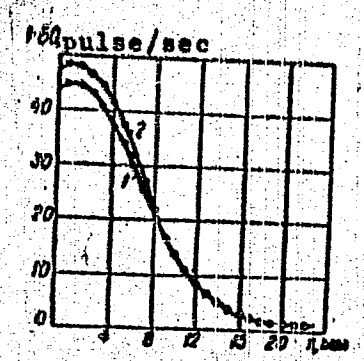

Fig. 1. Angular distribution of the γ-quanta arising as the result of annihilation: 1 — temperature = 20C; 2 — temperature = 110.

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L 34108-65 EWT(m)/T/EWP(t)/EWP(b)/EWA(c) Pad IJP(c) JD/JW/HW
ACCESSION NR: AT5005116 S/2601/64/000/019/0074/0078

AUTHOR: Dekhtyar, I. Ya. (Doctor of technical sciences); Madatova, E.G.

TITLE: Comments on the irreversible change in form of pure metals during cyclic heat treatment

SOURCE: AN UkrSSR. Institut metallofiziki. Sbornik nauchnykh trudov, no. 19, 1964. Voprosy fiziki metallov i metallovedeniya (Problems in the physics of metals and physical metallurgy), 74-78

TOPIC TAGS: vacancy, hardening temperature, heating cooling cycle, nickel wire, plastic deformation, annihilation, dislocation, elongation, cyclic heat treatment, annealing

ABSTRACT: Based on an investigation of the irreversible deformation of thin wire rods, the authors contend that vacancies, the effectiveness of which increases with the hardening temperature and the number of heating - cooling cycles, are a major factor in the mechanism of the processes that occur during cyclic annealing. These findings coincide with those of Takamura (Acta met., 1961, 9, 547). Experimental data for different metals show that in applying an invariable number of

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L 34108-65

ACCESSION NR: AT5005116

2

heating - cooling cycles, the diameter of the specimens affects elongation. Bending defelction measurements of Ni wire specimens attached at both ends showed that, under similar hardening conditions, the relative changes in elongation exceed those of unattached specimens considerably, a fact attributed to the difference in the character of thermal stresses. The functional relationship between plastic deformation and hardening temperatures (see Figs. 1 and 2 of the Enclosure) is of a general nature in the case of wire rods. The excess concentration of vacancies, which form under the influence of high-temperature quenching, undergoes annihilation during the interaction with dislocations. The probability of vacancy formation and that of annihilation on dislocations are not equal since the former is determined by the energy of vacancy formation and the latter by the activation energy of displacement. The authors conclude that the mechanism of the process is determined by the interaction between vacancies and dislocations which causes incremented deformation under the influence of repeated heating - cooling cycles. Orig. art. has: 3 figures, 1 table and 4 formulas.

ASSOCIATION: Institut metallofiziki AN Ukr.SSR (Metal physics institute, AN Ukr.SSR)

SUBMITTED: 20Jun63 ENCL: 02 SUB CODE: MM

NO REF SOV: 014 OTHER: 003

Card 2/4

L 34108-65
ACCESSION NR: AT5005116 ENCLOSURE: 01

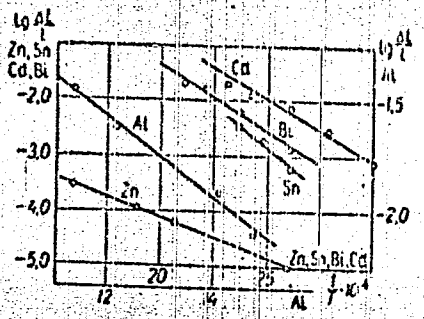

Figure 1. Temperature versus elongation in pure metal specimens after 200 heating - cooling cycles.

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L 34108-65
ACCESSION NR: AT5005116 ENCLOSURE: 02

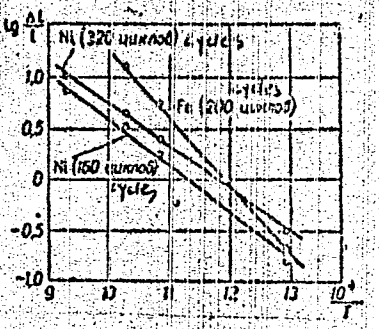

Figure 2. Temperature versus elongation in Fe and Ni specimens.

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ACCESSION NR: AP4041147 S/0020/64/156/004/0795/0798

AUTHOR: Dekhtyar, I. Ya.; Levina, D. A.; Mikhalenkov, V. S.; Kurdyumov, G. V. (Academician)

TITLE: Annihilation of positron and electrons in plastically deformed spectra

SOURCE: AN SSSR. Doklady*, v. 156, no. 4, 1964, 795-798

TOPIC TAGS: electron positron annihilation spectra, plastically deformed metal, nickel iron alloy, electron energy distribution

ABSTRACT: The authors used the method of electron-positron annihilation in metals for the study of the effect of plastic deformation on electronic structure, since the annihilation spectra gives information about the energy distribution of electrons in metals. The study was conducted on nickel and iron-nickel alloy of invar composition because the physical properties of there metals are determined by the interaction and distribution of d- and s-electrons, and because the contribution of d-electrons to the annihilation spectra is considerable. The method was described by the authors earlier (Voprosy* fiz. met. i metalloved, no. 12, 46 (1961)). The positron source was Na^{22}. The specimen were deformed by rolling to about 75% and were annealed in argon at 950C for 3 hours. The angular distribution

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ACCESSION NR: AP4041147

of gamma-rays was measured with a scintillation counter. In the region of maximum, the annihilation radiation was larger for deformed specimen than for the annealed ones. The results are qualitatively interpreted in terms of the influence of the redistribution of s- and d-electrons in the distorted regions of the crystals around dislocations, and a subsequent redistribution of electronic momenta. Orig. art. has: 1 figure.

ASSOCIATION: Institut metallofiziki, Akademii nauk USSR. (Institute of Physics of Metals, Academy of Sciences USSR)

SUBMITTED: 13Jan64 ENCL: 00

SUB CODE: NP, MM NO REF SOV: 005 OTHER: 003

Card 2/2

ACCESSION NR: AT4010697 S/2601/63/000/017/0132/0137

AUTHOR: Gertsriken, S.D. (Deceased); Dekhtyar, I. Ya.; Kunok, L. M.; Pilipenko, V.V.; Khazanov, M.S.

TITLE: A study of the processes of diffusion and oxidation in the alloy ZhS-6k under conditions of cyclic heat treatment

SOURCE: AN UkrRSR. Insty*tut metalofizy*ky*. Sbornik nauchny*kh trudov, no. 17, 1963. Voprosy* fiziki metallov i metallovedeniya, 132-137

TOPIC TAGS: thermal fatigue, heat treatment, flaw formation, chromium diffusion, nickel diffusion, volatilization, concentration gradient, oxidation, alloy ZhS-6k, cyclic heat treatment, radioactive isotope, diffusion

ABSTRACT: The number of cycles of heating and cooling before the appearance of cracks is usually taken as a measure of thermal fatigue. After studying the dynamics of the appearance of cracks using the roentgenographic (X-ray) method, V.I. Arkhirov noted that it is preceded by the development of block structure and the bending and buckling of blocks. One must assume that diffusion with high temperature conditions and cyclic stresses plays an important, if not decisive, role. Diffusion and cyclic stresses lead to the separation of a

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ACCESSION NR: AT4010697

second phase (carbides and intermetalloids) into a finely-dispersed state, and in addition, to the redistribution of elements between the body of the grain and the border zones; thus, these two processes do have a substantial influence on the durability of materials. As a rule, cyclic heat treatment has a negative effect on the mechanical characteristics of materials: with an increase in cycles, durability decreases. The diffusion of Cr and Ni in the alloy ZhS-6k was investigated by vaporization in a vacuum and by radioactive isotopes. If one of the components of an alloy has a comparatively high vapor tension, it will be easily vaporized when heated in a vacuum. As a result of this vaporization, a gradient of concentration will form in the alloy, and this component will evaporate from the surface to the extent that the substance arrives at the surface by means of diffusion. Measuring the quantity of evaporated substance, it is possible to determine the coefficient of diffusion of the component with high vapor tension. Calculations of this coefficient were made according to the formulas given by Grinberg and later made more precise and tabulated by Herzricken and his associates. For instance, knowing the percentage of Cr in an alloy it is possible to determine its absolute weight in a given sample. The change in the weight of the sample during heat treatments results,

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it is assumed, from the evaporation of the volatile element Chromium. Therefore, it is possible to determine the coefficients of diffusion of Cr at various temperatures. In this particular case, the coefficients of diffusion were obtained for 5 temperature points between 1273 and 1423K. To determine the energy of activation of the process of diffusion of the alloy under investigation, the dependence of the coefficient of diffusion on temperature was utilized. High values of the energy of activation of diffusion of the alloy under investigation and its comparatively low coefficients of diffusion showed that this alloy to a considerable degree resists softening at high temperatures. Diffusional annealing of the samples was carried out in a quartz tube pumped out, filled with Argon and placed in an electric furnace. The oxidation of the alloy ZhS-6k at constant temperature was investigated. A special installation which permits weighing samples without taking them out of the furnace was developed to investigate the alloy for isothermic oxidation. Hence, continuous annealing and continuous observation of changes in weight due to oxidation was assured. Table I of the Enclosure shows the time-temperature-weight interrelation for three temperature points. The curves are in accordance with the law of parabolic oxidation. In contrast to the results of continuous heating, a decrease in the weight of samples dependent on the time of treatment took place in conditions of cyclic heat treatment. The weight

ACCESSION NR: AT4010697

decreased because of the breaking away of oxides at the moment of a sharp change in temperature. Comparison of results obtained from our alloy with the data about oxidation obtained from Nichrome (Ni-Cr-Fe alloy) showed that at 1373K the speed of oxidation of ZhS-6k is approximately 1.5 times less than that of Nichrome under similar conditions. Orig. art. has: 3 formulas, 4 figures, and 2 tables.

ASSOCIATION: Insty*tut metalofizy*ky*, AN UKrRSR (Institute of Metallurgical Physics AN UKrRSR)

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