REPAS, Pal; SAJO, Istvan, dr.; GEGUS, Erno

Determination trace impurities in steel and cast iron. Pt. 1.
Koh Lap 96 no.9:427-430 S '63.

1. Vasipari Kutato Intezet.

GEGUS, Erno

Investigations in the field of the solution spectrum analysis of nonconducting substances. Kem tud kozl 20 no.3:315-321 '63.

1. Vasipari Kutato Intezet, Budapest.

GEGUS, Erno

Determining the disturbing effects in the spectrum analysis of nonconducting materials using solutions. Magy kem folyoir 70 no.12:524-526 D '64.

1. Iron Industry Research Institute, Budapest.

GEGIS, Erno

Determination of trace elements in iron and steel by means of spectrum analysis. Pt. 2. Kor Lap 68 no.1:33-36 Ja '65.

1. Iron Industry Research Institute, Budapest.

HUNGARY/Analytical Chemistry - Analysis of Inorganic Substances. E-2

Abs Jour: Referat Zhur-Khimiya, No 5, 1958, 14218

Author : Erdey L., Gegus E., Kocsis E.
Inst : Hungarian Academy of Sciences. - Inst fur allgemeine Chemie, Tech. Univ. Budapest
Title : Spectral-Analytical Determination of the Content of Magnesium, Zinc, Vanadium and Chromium in Pure Aluminum with the Use of a Perforated Electrode.

Orig Pub: Acta chim. Acad. sci. hung., 1957, 11, No 3-4, 277-294.

Abstract: Finely atomized solution under study is introduced into the analytic gap through the internal channel of lower electrode inseted in the outlet opening of the atomizer. A comparison is made with the method of direct deposition of the solution onto the lower electrode with a subsequent excitation of the spectrum of the dry residue. The new method provides greater accuracy, sensitivity and speed of analysis. Standard solutions are prepared by dissolution of Al (99.99%) in HCl;

Card : 1/2

HUNGARY/Analytical Chemistry - Analysis of Inorganic Substances. E-2

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514610010-3"

Abs Jour: Referat Zhur-Khimiya, No 5, 1958, 14218

to this solution are added, with a micropipette, the solution of Zn, Mg, V and Cr and chemical analysis is performed. A series of solutions was prepared with a content of the components from 0.0003 to 1.0%. The spectra are photographed in a medium ISP-22 spectrograph with a single-lens illumination at 0.02 mm width of the slit. Spectrum excitation by spark from Feissner generator (C = 6000 picnofarads, L = 0.8 microhenry; I = 2.5 a). Conversions of blackenings are carried cut and background is taken into account for all the elements except Mg. Analysis is conducted according to lines (in A): Mg 2795.53 - Al 3050.08 for concentrations 0.001-0.2% Mg, and Mg 2790.79 - Al 3050.08 for 0.1-17.5% Mg, Zn 3345 - Al 3050.08, Cr 2677.26 - Al 26.52.49, V 3110.71 - Al 3050.08. Background determination is made in the proximity of 3348.5 A. If width of slit is reduced to 0.01 mm the sensitivity of Zn detection can be raised from 0.02 to 0.008%. Mean error of determination of all elements is of ± 4-5%.

Card : 2/2

GEGUZHIS, K. [Geguzis, K.]

Using soapsuds mixed with sawdust for preventing the sticking of concrete mixes to forms. Suggested by K. Geguzis. Rats. predl. no. 41:13-15 '59. (MIRA 14:1)
(Concrete slabs) (Concrete--Formwork)

GEGUS, Erno (Budapest XI, Fehervari ut. 130)

A quick spectrochemical solution method for investigating blast furnace and open hearth slags. Acta chimica Hung 28 no.1/3:65-74 '61. (EEAI 10:9)

1. Eisenforschungsinstitut, Budapest.

(Spectrum analysis) (Blast furnaces)
(Open-hearth process) (Slag)

GEGUZIN, S.

Molodiye stroiteli Volgo-Dona [Young builders of the Volgo-Don Canal]. Moskva, Molodaia gvardiia, 1952. 56 p.

SO: Monthly List of Russian Accessions, Vol. 7 No. 2 May 195..

GEGUZIN, S.

Nashe komsomol'skoe delo (Our Communist Youth work). Moskva, "Molodaia gvardiia," 1954. 24 p.

SO: Monthly List of Russian Accessions, Vol 7, No 9, Dec 1954

GOLYSHEV, N.; GRUZIN, S.; EKONOMOV, L., red.; SHUVALOV, I., tekhn. red.

[Let's catch up with America!] Dogonim Ameriku. [Moskva] Izd-vo TsK VLKSM "Molodaia gvardiia," 1958. 191 p. (MIRA 11:7)
(Agriculture)

YAKOVLEV, T.; GEGUZIN, S.; KOSTIN, V., red.; TROYANOVSKAYA, N., tekhn.red.

[Lights of Sokolina Hill; brigades of Communist labor] Ogni gory Sokolinoi; o brigadakh kommunisticheskogo truda. Moskva, Gos. izd-vo polit.lit-ry, 1959. 30 p. (MIRA 12:4)
(Labor and laboring classes)

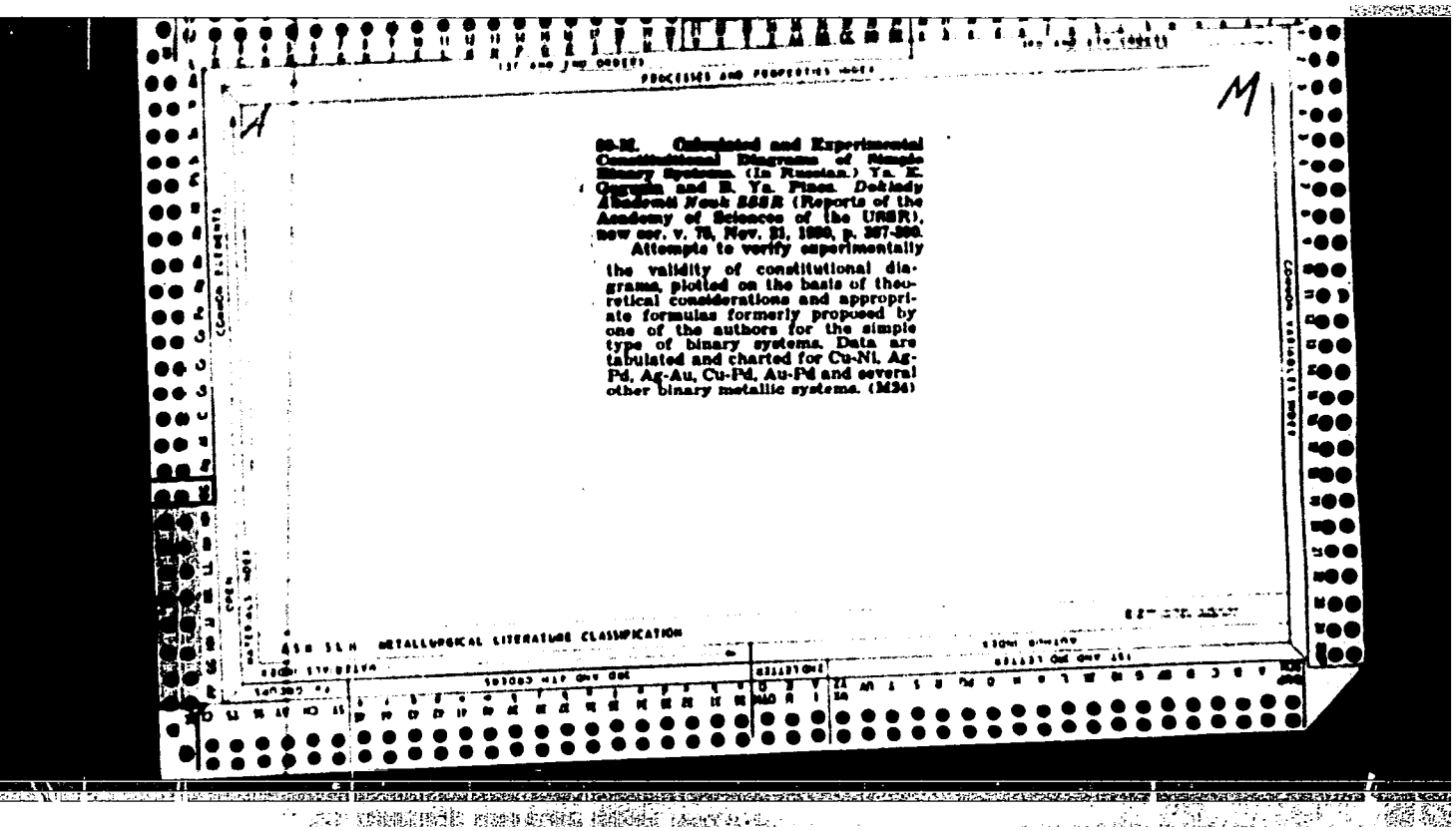
KIREYEV, Aleksandr Terent'yevich; OBOLUZIN, Semen Yakovlevich; MARTISHIN, V.V., red.; BERLOV, A.P., tekhn.red.

[A generation's achievement] Podvig pokoleniia. Moskva, Izd-vo "Znanie," 1958. 22 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii. Ser.9, no.3, Molodezhnaia). (Reclamation of land) (MIRA 12:2)

GEGUZIN, S.Ya.

GEGUZIN, Semen Yakovlevich; YAKOVLEV, Tovly Yakovlevich; KOSTIN, V., red.; [illegible], A., tekhn.red.

[What the October Revolution gave the peasants] Chto dala Oktiabr'skaia revoliutsiia krest'ianam. Moskva, Gos. izd-vo, 1957. 87 p. (MIRA 11:2)
(Agriculture) (Peasantry)



60-M. Calculated and Experimental Constitutional Diagrams of Simple Binary Systems. (In Russian.) Ya. E. Geguzin and B. Ya. Pines. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser. v. 75, Nov. 21, 1950, p. 387-390.

Attempts to verify experimentally the validity of constitutional diagrams, plotted on the basis of theoretical considerations and appropriate formulas formerly proposed by one of the authors for the simple type of binary systems. Data are tabulated and charted for Cu-Ni, Ag-Pd, Ag-Au, Cu-Pd, Au-Pd and several other binary metallic systems. (M34)

C.A.

Energy of mixing of binary metallic systems Ya. I. Geguzin and B. Ya. Pines (Phys.-Tech. Inst., Acad. Sci. Ukr. S.S.R., Khar'kov). *Doklady Akad. Nauk S.S.S.R.* 75, 535–8(1950).—The energies of mixing in the systems Pb-Sn, Bi-Cd, Bi-Sb, Bi-Sn, and Pb-Bi were detd. from the heat of fusion and the heat capacity in the region of liquid plus solid. These quantities were measured by a *high-temp. adiabatic calorimeter* which permitted successive measurements of heat capacity throughout the range from solid to liquid in a single test, and at the same time detd. the heat of fusion. The exptl. complete heat of fusion, Q_0, was the sum of Q_0, the heat consumed in heating the alloy in the liquid-plus-solid region, and Q_0, the heat used in the phase change. To det. the energy of mixing it was necessary to know Q_0 as a function of concn. Q_0 was detd. from the observed dependence of heat capacity of the solid and liquid phases on concn. From the calcd. values of Q_0 were detd. U_L^1, the energy of mixing in the liquid phase, and U_S^1, the energy of mixing in the solid phase, on the assumption that the potential energy of the soln. can be expressed as $N[(U_{AA}/2)(1 - a) + (U_{BB}/2)a + U_{AB}(1 - a)]$, where a is the concn. and U_{AA} and U_{BB} are the potential energies of like atoms. In the Pb-Sn system $U_L^1 = 1.0 \times 10^{-13}$ erg/mol. and $U_S^1 = 1.3 \times 10^{-13}$. In the Bi-Cd system $U_L^1 = 0.15 \times 10^{-13}$. In the Bi-Sb system $U_L^1 = 0.27 \times 10^{-13}$ and $U_S^1 = 0.56 \times 10^{-13}$; the latter value was affected by non-equil. conditions. In the Bi-Sn system $U_L^1 = 0.55 \times 10^{-13}$ and $U_S^1 = 2.65 \times 10^{-13}$. In the Pb-Bi system $U_L^1 = -1.1 \times 10^{-13}$ and $U_S^1 = +8 \times 10^{-13}$. These values predicted liquidus and solidus lines in good agreement with expt. except for the solidus of the Bi-Sb system. The U_L^1 values agreed with reported short-range order in liquid Pb-Sn and Bi-Sn but did not agree with that in Pb-Bi alloys. The energy of mixing detd. alternatively from the "jump" in heat capacity during heating through the solidus and liquidus lines agreed well with the former value in the Pb-Sn and Bi-Sn systems but not in the Bi-Cd system because of non-equil. conditions. A. G. Guy

[illegible], Ya. Ye.

PA 194T17

USSR/Chemistry - Lead-Tin Alloys Oct 51

"Energy of Mixing of Binary Metal Alloys. 1. The Lead-Tin System," Ya. Ye. Geguzin, B. Ya. Pines, Physicotech Inst, Acad Sci Ukrainian SSR, Khar'kov

"Zhur Fiz Khim" Vol XXV, No 10, pp 1228-1238

With high-temp adiabatic calorimeter of new design, detd temp dependence of sp heat in transition of alloy from solid to liquid state and detd mp. Data on heat effects under melting of binary alloys showed that mp and sp heat in region of sepn, detd energies of mixing in liquid

194T17

USSR/Chemistry - Lead-Tin Alloys (Contd) Oct 51

and solid phases of Pb-Sn system. Sepn occurred in equil under exptl conditions. Constructed equil diagram from energies of mixing of Pb and Sn in liquid phase and solid soln. Findings agreed with data from x-ray investigation of liquid alloy of eutectic concn.

194T17

GEGUZIN, YA. E., PINES, B. YA.

Alloys

Energy of mixing of binary metallic alloys. 4. Systems bismuth - tin and bismuth - lead. Zhur. fiz. khim. No. 2, 1952.

9. Monthly List of Russian Accessions, Library of Congress, September 1952/1958, Uncl.

[illegible], YA. [illegible]

X-[illegible]

Con[illegible] Ru[illegible] [illegible], No. [illegible], 195[illegible].

Monthly List of Russian Accessions, Library of Congress, [illegible]. Unclassified.

GEGUZIN, YA E.

Self diffusion and viscous flow (sintering and creep) in pressed metal powders. Ya. E. Geguzin, L. O. Makon, and B. Ya. Pines (A. M. Gorkii State Univ., Kharkov). *Doklady Akad. Nauk S.S.S.R.* 87, 577-80(1952).—It had been shown by P. (*C.A.* 41, 676*b*) that the equil. concn. of vacancies, C_0, in a metal is decreased by a compressive stress, P, an amt., $\Delta C = (P\delta^3/kT)C_0$, where δ is the lattice spacing. Therefore a difference in vacancy concn. would exist between the end and sides of a rod of length L and radius R subjected to simultaneous longitudinal tension, P_1, and sidewise compression, P_2. A flow of vacancies of atoms would occur that would cause a rate of elongation $(1/l)(\Delta L/L) = D\delta^3(P_1 - P_2)/(kTAR) = (P_1 - P_2)/\eta$, where l is the time. D is the self diffusion coeff., λ is a certain linear distance detg. the concn. gradient, and η is a coeff. of viscosity. An analogous relation between η and D holds for sintering of metal powders. Expt. data were obtained on 20–40-μ powder of electrolytic Cu and of Fe reduced from scale. Pressing was done in a mold 4.2 mm. in diam. and 7.5 mm. high, and pressures up to 6 kg./sq. cm. were maintained. And sintering H_2 was done at temps. of 900° (Cu) and 1100° (Fe). $[(\Delta V/V)_t - (\Delta V/V)_0]$ increased linearly with increasing maintained pressure, P, where V is the vol. The "Laplace pressure" on the pore surfaces was 5.7 kg./sq. cm. for Cu and 2.0 for Fe. The viscosity was independent of pressure. The deduced values of self-diffusion coeff. were 10^{-9} sq. cm./sec. for Cu and 10^{-9} for Fe. Distortions in the cryst. lattice of the powder caused these values to be high. From the temp. dependence of viscosity the activation energy for diffusion was calcd. to be 38,000 cal./mole for Fe and 12,000 for Cu. A. G. Guy

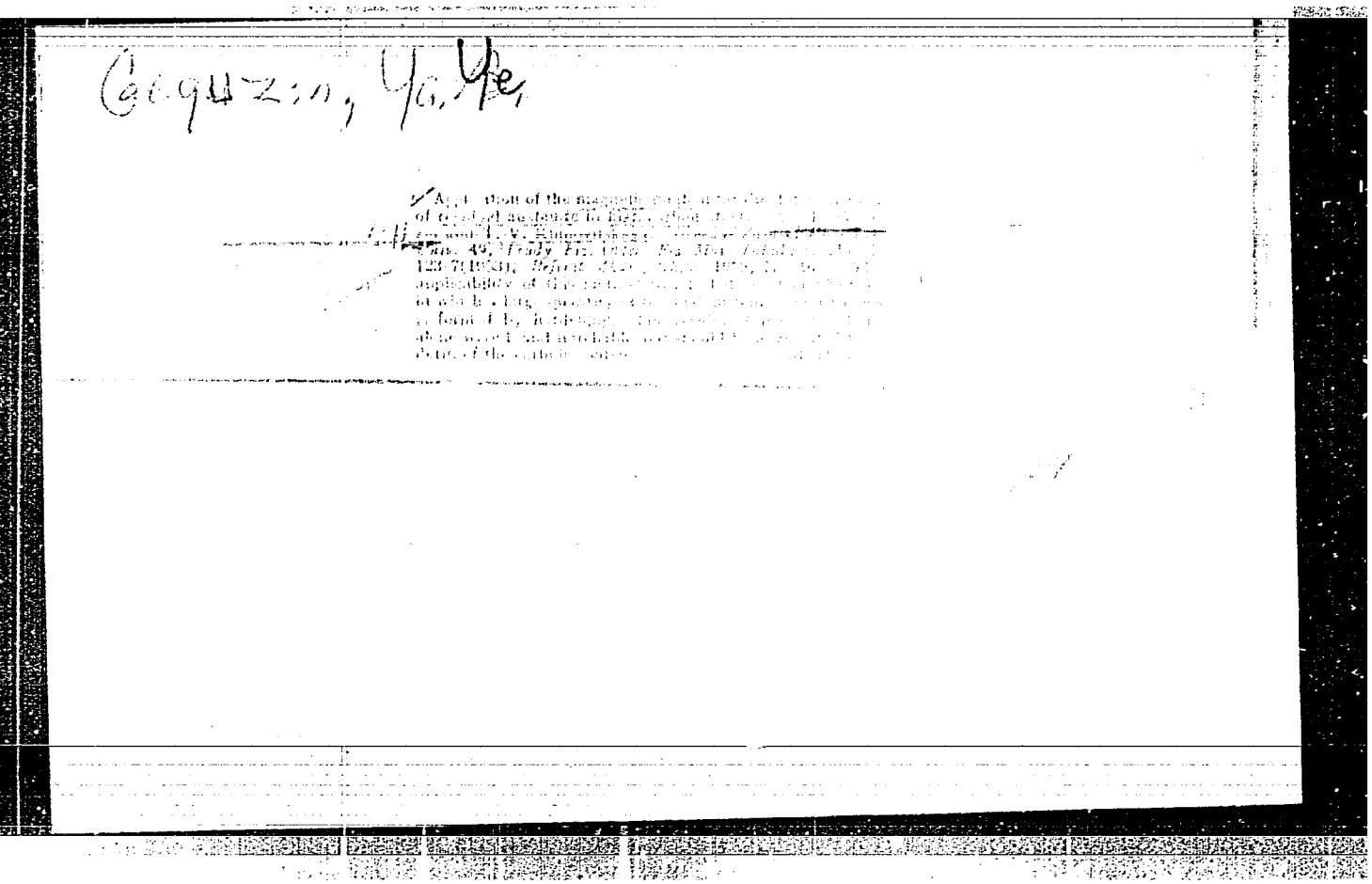
(2)

GEGUZIN, Ya. Ye., PINES, B. Ya. and SMUSHKOV, I.V.

"Microtension in the Crystal Lattice and Calcining Metallic Powders". Uch. Zap. Khar'kovsk. Un-ta, T.49, Fiz. Otd. Fiz.-Matem. Fak., Vol. 4, pp 111-117, 1953.

Studied structural changes during the calcining process by means of X-ray analysis of samples of compressed powder of electrolytic copper and of nickel powder. The samples were calcined at various temperatures for various periods of time in a deoxygenated atmosphere. Analysis indicated that at temperatures below 400° for copper and below 700° for nickel, microtension is totally removed, and therefore these temperatures have no effect on the calcining process. (RZhKhim, No 4, 1955)

SO: Sum No 884, 9 Apr 1956



Gouzenko, Igor

GEGUZIN Ya Ye

USSR.

Self diffusion and heterodiffusion in heterogeneous porous bodies. By Ya. Pines and Ya. E. Geguzin. *Zhur. Tekh. Fiz.* 23, 1051-72(1953).—A central wire of Ni was surrounded by 6 wires of Cu (or vice versa), the bundle was inserted in a Cu tube and slightly drawn down to insure good contact between the metals. Other investigated pairs were Fe-Cu, Fe-Ni, and Ag-Ni. The assembly was heated in H or in vacuum at 1040°. Micrographs show that the inner Ni wire increases in diam. and the Cu wires decrease. The Cu wires become porous. Gradually the whole assembly is baked together. If the central wire is Cu, the pores appear in the center and the outer wires increase in diam. Thus Cu diffuses into Ni with a speed at 1040° in vacuum of 1.3×10^{-9} sq. cm./sec. and in H of 2.8×10^{-9} sq. cm./sec., but Ni does not diffuse into Cu. The observed porosity is explained by an increase in the number of vacancies and considered as a proof of the vacancy theory of diffusion. It is shown theoretically that the diffusing atoms will be those of the component with the lower latent heat of evapn. S. Ro.

(1)

Geguzin, Ya. E.

USSR

The kinetics of the sintering of pressed metallic powders. B. Ya. Pines and Ya. E. Geguzin. *Zhur. Tekh. Fiz.* 23, 2078-92(1953).—Dilatometric determs. of contraction were made on samples that had been sintered stepwise to det. the relation between sintering of pressed metal powders and time and temp. It was shown that isothermal contraction in the initial stage increases linearly with time, *t*. For longer periods of sintering it is proportional to $t^{1/2}$. The kinetics of the sintering process are explained on the basis of the distortion of the lattice. J. Rovtar Leigh

GEGUZIN, Ya. E.

.7

(4)

A method of determining the temperature of appearance of liquid phase in mixtures of solid products. M. Kh. Ghitman, A. L. Gertsbiis, and Ya. E. Geguzin (A. M. Gor'kii State Univ., Kharkov). *Zhur. Prikład. Khim.* 26, 1221–3(1953).—Appearance of a liquid phase, such as a eutectic mixt., can be observed microscopically by the appearance of "contact melting" of a small piece of one solid phase on a thin layer of the 2nd on a suitable melting block. V. N. Bednarski

10-12-54
mtc

GEGUZIN, Ya. Ye., MAKHONIN, V.M., PINES, B.Ya.

"Laws Goverining the Sintering of Compact Metallic Powders," Uch. zap. KhGU, v. 48, TR. Fiz. otd., No. 4, Kh. St. Univ. publication. 1953

GEGUZIN, Ya.Ye., MARKON, L.O., PINES, B.Ya.

"Viscous Stream and Self-Diffusion (sintering and creep) in Crystalline Bodies in Compact Metallic Powders," Uch. zap. KhGU V. 48, Tr. Fiz. otd., NO. 4, Kh. St. Univ. publication. 1953

GEGUZIN, Ya.Ye., KLIMOVITSKAYA, T.V.

"The Applicability of The Magnetic Method of Determining the Quantity of the Residual Austenite in High-Carbon Steels," Uch. zap. KhGU, V. 48, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication, 1953.

GEGUZIN, Ya.Ye.

"Sintering and Viscous Stream of Amorphous Bodies," Uch. zap. KhGU, v. 48, Tr. Fiz. otd., Kh. St. Univ. Publication. 1953

GEGUZIN, Ya.Ye., GAL'PERINA, L.I., PINES, B.Ya.,

Thermal Effects During the Sintering of Metallic Powders," Uch. zap. KhGU, V. 48, Tr. Fiz. otd., No. 4, Kh. State Univ. publication. 1953

GEGUZIN, Ya.Ye., PINES, B.Ya., SMUSHKOV, I.V.

"Microstrains in a Crystal Lattice and the Sintering of Metallic Powders," Uch. zap. Kh(U, V. 48, Tr. Fiz. otd., No. 4, Kh. St. Univ. publication, 1953.

GEGUZIN, YA.YE.

62 Distortion of the crystal lattice and sintering of metal powders. L. I. Gal'perina, Ya. E. Geguzin, B. Ya. Pines, and I. V. Smushkov (A. M. Gor'kii State Univ., Kharkov). *Doklady Akad. Nauk S.S.S.R.* 88, 265-8(1953)[Brutcher Translation No. 3088].—Changes in the stresses and distortion in metal powders as a result of annealing were studied by x-rays and sp.-heat measurements. The sp. heat was detd. during heating at 2.0 to 2.8 degrees/min. with a high-temp. adiabatic calorimeter. A Cu compact made of 100-μ powder with a porosity of 20% evolved 6.25 cal./g. with the max. rate at 350°. 40–50-μ powder with 35% porosity evolved 11.25 cal./g. with the max. at 275°. 10–20-μ Ni powder with 15% porosity evolved 14.00 cal./g. with a 550° max. Thirty-μ Fe powder with 10% porosity evolved 12.00 cal./g. with a 330° max. This release of energy corresponded to decreases in stresses of the 2nd and 3rd kinds and was not caused by decrease in the surface area of the pores. X-ray measurements were made on specimens 6.2 mm. in diam. and 2 mm. long pressed from 40–50-μ electrolytic Cu powder or from 10–20-μ Ni powder. For Cu the elastic energy, estd. from line breadth, decreased from 4.2×10^{-1} cal./g. to nearly zero in >400 min. at 100°, 100 min. at 150°, 40 min. at 200°, and 10 min. at 250°. If a diffusion process caused the decrease in microstresses, the activation energy was 20,000 cal./mol., close to the 12,000 cal./mol. characteristic of the initial stage of diffusive sintering. Since the microstresses were eliminated at a low temp. they could have little effect on the sintering process compared to the effect of the initial energy of distortion. Distorted regions in the lattice could increase the concn. of vacancies and decrease the activation energy for self-diffusion. A. G. Guy

(3)

GEGUZIN, Ya. E.

USSR.

Sintering of amorphous bodies. Ya. E. Geguzin. *Doklady Akad. Nauk S.S.S.R.*, 92 [1] 45–48 (1953). The Frenkel theory (1946), that the mechanism of sintering of crystalline powders does not differ essentially from the mechanism of the merging of liquid drops, was checked with the aid of glass capillaries. Capillaries of ordinary silicate glass were heated to the "softening" temperature, and the "spontaneous" decrease of inner diameter was noted. The capillaries were rotated during heating at 2 r.p.m.; decrease in diameter was uniform along the length. a_t, the radius at any time t, is expressed by $a_t = a_o - (\sigma/\eta)t$, where a_o is original radius, η is coefficient of viscosity, and σ is coefficient of surface tension. Experimental data agreed with the equation. The above equation was used to determine the viscosity of the glass by assuming that $\sigma = 300$ ergs/cm^2 and that η does not depend on the temperature. From the η at various temperatures, the energy of activation was found to be 8.8×10^4 cal/mole. For a spherical pore, $a_t = a_o - (3\sigma/4\eta)t$; assuming that all the pores, N, have the same original diameter, a_o, the volume change $\Delta V/V$ of the specimen (compressed powder) can be expressed by

$$\Delta V/V = 4N\pi a_o^3/3V\,[1 - (1 - 3\sigma/4\eta a_o)^3]$$

This equation shows good agreement with the dilatometric curve of the shrinkage of a porous glass body (Ivensen, 1952) up to a sintering period of $t \leq 20$ hr., which takes place for $\eta a_o = 5 \times 10^9$. Small differences between experimental and calculated curves for large periods is explained by gas pressure within pores.

B.Z.K.

Khar'kov State U. im. Gor'kiy

Geguzin, Ya. E.

USSR

"A Study of Sintering of Compressed Metal Powders under Conditions of Pressure from All Sides. Ya. E. Geguzin and B. Ya. Sukharevsky (*Zhur. Tekh. Fiziki*, 1956, 26, (9), 1613-1621).—[In Russian]. The fractional changes of vol. observed in sintering Cu and Ni powders were studied as functions of temp., applied pressure, and [illegible] of the powders. Results are interpreted on the basis of a vacancy theory of diffusion. A P B.

Geguzin, Ya. Ye.

USSR/Physics-Sintering

FD-1226

Card 1/1 Pub. 153-10/22

Author : Geguzin. Ya. Ye.

Title : Spheroidization of pores in porous bodies

Periodical : Zhur. tekh. fiz., 24, 1622-1625, Sep 1954

Abstract : During experimental observation of spheroidization of pores in porous bodies during sintering it was found that the contour of pores shift toward the center and that centers of pores shift toward solid particles. The collective recrystallization occurring during sintering produces irregular contours tending to circles. Indebted to Prof. B. Ya. Pines. Eight references including 3 foreign.

Institution :

Submitted : July 17, 1953

GEGUZIN, Ya. Ye.

USSR/Physics-Alloys, Diffusion FD-1227

Card 1/1 Pub. 153-11/22

Author : Geguzin, Ya. Ye. and Pek Yen-gin

Title : Microscopic study of mutual diffusion of metals in inhomogeneous porous bodies

Periodical : Zhur. tekh. fiz., 24, 1626-1630, Sep 1954

Abstract : A model of porous materials was used for studying diffusion processes occurring on contact surfaces between systems of Co-Ni, Co-Fe, Cu-Pt, Co-Pt. The metal with lower evaporation heat was found to diffuse into the other metal. Such diffusion produces porosity in the diffusing metal. Indebted to Prof. B. Ya. Pines. Eight references including 4 foreign.

Institution :

Submitted : June 17, 1953

GEGUZIN, Ya. YE.

V Changes in metal surfaces at high temperatures. Ya. E. Geguzin and N. N. Ovcharenko (A. M. Gorkii State Univ., Kharkov). *Doklady Akad. Nauk S.S.S.R.* 99, 389–90 (1954).—A polycryst. Cu specimen was carefully polished and then heated in a vacuum (approx. 10^{-5} mm. Hg), and the peculiar surface changes were studied with a microscope and a microinterferometer. At 850–950°, the cryst. surface becomes visible on the metal, with each crystal having a stairlike formation. The direction of the steps, their depth, and their width differ for different crystals, but are maintained in each crystal. The different faces of the steps are differently oxidizable, and remain const. within the crystal.
W. M. Sternberg

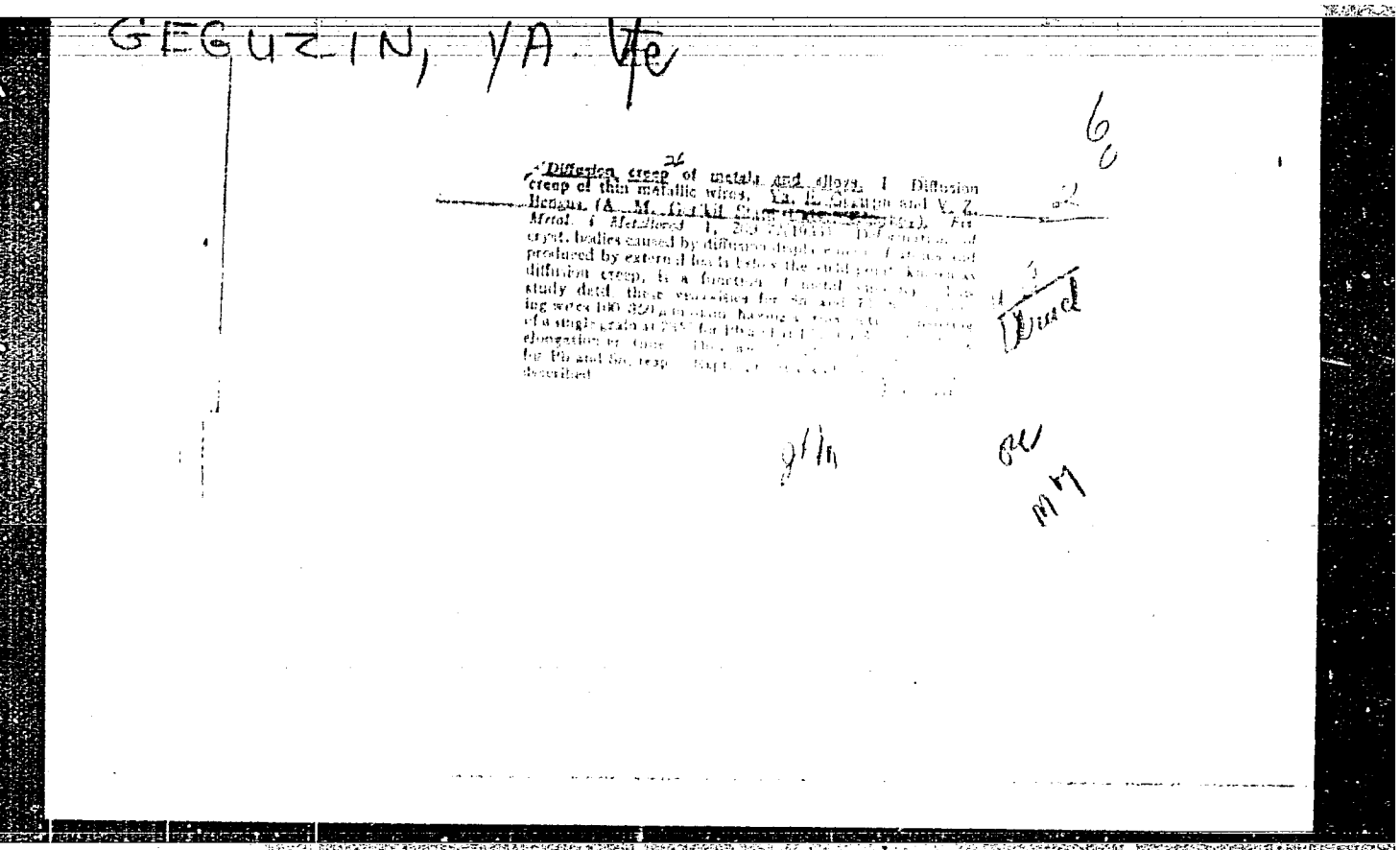
Translation, M-1080, 23 Apr 56

GEGUZIN YA. E.

706

The interfacial tension at the boundary of a solid and a liquid phase. Ya. E. Geguzin and N. N. Ovcharenko (State Univ., Kharkov). *Doklady Akad. Nauk S.S.S.R.* 1955, 537-8 (Russian summary, 538-9). The expt. demonstrates the "packing" of the liquid on its own solid phase, i.e. a visual proof is given that $\sigma_{12} < \sigma_1 - \sigma_2$, where σ_{12} is the interfacial tension at the boundary solid-liquid, σ_1 is the surface tension on the boundary solid-vacuum, σ_2 the surface tension at the boundary liquid-vacuum. This was demonstrated with the aid of needles of menthol (I) or were placed inside a film of liquid I. Werner Jacobson

GEGUZIN, YA. Ye



Diffusion creep of metals and alloys. I. Diffusion creep of thin metallic wires. Ya. E. Geguzin and V. Z. Bengus (A. M. Gorkii State [illegible]). *Fiz. Metal. i Metalloved.* 1, 203-[illegible] (1955). [illegible] cryst. bodies caused by diffusion [illegible] produced by external loads (also the [illegible] diffusion creep, is a function [illegible] study data [illegible] ing wires (80-320 [illegible] of a single grain at 295° for [illegible] elongation of [illegible] for Pb and Sn creep [illegible] described.

GROUZIN, Ya.Ye.

History of the Section of Solid State Physics. Uch.zap.KHGU 60:81-92 '55. (MLRA 10:1)

(Kharkov University--History)
(Physics)

GEGUZIN, Ya. E.

175. ON THE FORM OF PORES ARISING IN THE [illegible] DIFFUSION OF METALS. Ya.E.Geguzin. Dokl. Akad. Nauk SSSR, Vol. 100, No. 2, 255 ff (1955). In Russian. English translation in: Atomic Energy Res. Establ. (Harwell) Transl. No. 615, 4 pp. (1956).

Studies of diffusion of Zn from α-brass into Cu. The α-brass is enriched in holes and the systems can be regarded as a supersaturated solution of holes in the metal, from which the phase corresponding to the holes must separate. The form of the pores formed is the same as that of small crystals of the metal in which they arise -- in this case cubical.

A.E.D. Dore

Geguzin, Ya. E.

62 ✓ Physical processes on a metal surface at high temperatures. I. Natural roughness of polycrystalline surfaces. Ya. E. Geguzin and N. N. Ovcharenko. *Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk* 1956 No. 1 105-14.
Surface conditions were observed on polished polycryst. Cu specimens (99.95% pure). The specimens were polished either mechanically or electrolytically in a bath contg. H_3PO_4 (sp. gr. 1.19) for 15 min. at 70 mv. They were next heated (to 1000°) in a high vacuum (10^{-5} to 10^{-6} mm. Hg) and the surface studied metallographically and with micro interferometers. Under certain conditions the surface became rough. The step-like roughness can be characterized by the detn. of the depth and periodicity of the steps. Evapn. and condensation were active causes of the surface roughening. W. M. Sternberg

(1)

Khar'kov Mining State University

Investigation of some physical processes occurring on the metal surface at high temperature ff [illegible] in the metal adjoining the surface [illegible]

[illegible] The [illegible] the sample, crossed by the [illegible] mentally. The natural roughness [illegible] surface is found to be the cause of an [illegible] oxidization time as a result of which a [illegible] surface is formed. The connection between [illegible] thickness and the [illegible] particle size [illegible] is discussed. [illegible]

Geguzin, Ya. Ye.

USSR / Diffusion. Sintering. E-6

Abs JOur : Ref Zhur - Fizika, No 4, 1957, No 9345

Author : Geguzin, Ya.Ye.
Inst : Khar'kov University, USSR
Title : Investigation of the Sintering of Mixtures of Metal Powders. The Copper-Nickel System. Isomer Powders.

Orig Pub : Fiz. metallov i metallovedeniye, 1956, 2, No 3, 406-417

Abstract : Report on the results of an experimental investigation of the time and temperature dependence of the linear shrinkage of pressed specimens, obtained by pressing mixtures of approximately isomer powders of copper and nickel. The experimental results were interpreted with the aid of formulas obtained under the assumption that the observed linear shrinkage is a result of the summation of the shrinkages at the individual contacts between neighboring powder particles. A connection was established between the kinetics of the process

Card : 1/2

USSR / Diffusion. Sintering. E-6

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9345

Abstract : of linear shrihkage and the process of diffusion homogenization of the mixtures. It is shown that at the early stage of the sintering process, the mutual diffusion prevents the shrinkage process, which is a result ofthe occurrence of diffusion porosity.

Carx : 2/2

539 217

6949 THE INFLUENCE OF PRESSURE ON THE MUTUAL
INTERDIFFUSION OF METALS IN
DUCTION OF DIFFUSION POROSITY
Dokl Akad Nauk SSSR, Vol
Russian

Interdiffusion between α-brass [illegible] where
the diffusion coefficient
[illegible]
the brass but when a pressure
formation was suppressed
was also reduced Similar results were
Cu – Ni system

S/564/57/000/000/006/029
D258/D307

AUTHOR: Geguzin, Ya. Ye.

TITLE: Nucleation and growth of negative crystals (pores) from supersaturated solutions of vacancies in a crystal lattice

SOURCE: Rost kristallov; doklady na Pervom soveshchanii po rostu kristallov, 1956 g. Moscow, Izd-vo AN SSSR, 1957, 91-97

TEXT: The author derives an expression for the radius of a critical nucleus:

$$r^* = \frac{\xi_0}{\Delta\xi} \cdot 2\sigma \frac{a^3}{kT}, \qquad (4)$$

and for the work of its formation in a solution with a given

Card 1/2

Nucleation and growth...

degree of supersaturation:

$$\Delta\Phi_3 = \frac{4}{3}\pi r^{*2}\sigma = \frac{16\pi\sigma^3 a^6 \xi_0^2}{3(kT)^2 (\Delta\xi)^2} . \quad (7)$$

Linear dimensions of a critical nucleus can be estimated by extrapolating the experimental dependence $L = \varphi(\sqrt{t})$ to $t = 0$. Results obtained in this way are plotted. Using experimental data on the magnitude of supersaturation in brass during evaporation of zinc, the author concludes that spontaneous nucleation of negative crystals has little probability. Negative crystals which are observed are probably due to the development of microcracks. There are 5 figures.

Card 2/2

126-3-3/34

AUTHORS: Geguzin, Ya. Ye. and Ovcharenko, N. N.

TITLE: Excess vacancies occurring in brass during evaporation of zinc (in a system with a "vacancy source"). (Ob izbytochnykh vakansiyakh, voznikayushchikh v latuni pri isparenii tsinka (v sisteme s "istochnikom vakansiy").

PERIODICAL: "Fizika Metallov i Metallovedeniye" (Physics of Metals and Metallurgy), 1957, Vol.IV, No.3, pp. 400-406 (U.S.S.R.)

ABSTRACT: In this paper the authors aimed to follow experimentally certain details of phenomena taking place in one of the types of specimens with a "vacancy source", namely, in specimens of an alloy from which the volatile component is removed. The selection was governed by the desire to follow simultaneously the kinetics of the coagulation of the excess vacancies and the kinetics of their removal from the specimen which can be materialised most easily on specimens of an alloy which does contain a volatile component. Brass containing 30% zinc was used for the investigations in the form of 20 mm long, 4 mm dia. cylindrical specimens after preliminary stabilisation by annealing at 820 C. The time and temperature dependence of the decrease in weight and volume of α-brass specimens was followed experimentally after removing the volatile component, i.e. the zinc. On the basis of the obtained

Card 1/2

Excess vacancies occurring in brass during evaporation of zinc (in a system with a "vacancy source"). (Cont.)

results of the time dependence of the changes in weight and volume of specimens, the relative quantities were evaluated of the excess vacancies which coagulate in the pores and are removed from the specimen. On the basis of metallographic data of the dimensional distribution of the pores as a function of the depth, assumptions are made on the character of the distribution of the concentrations of excess vacancies. A method is proposed for determining the concentrations of the vacancies according to given values of $\Delta P(\tau)$ and $\Delta V(\tau)$, where ΔP and ΔV are respectively the weight and volume of the vacancies and τ, time. By means of this method the concentration of vacancies in the temperature range 800 to 900C is evaluated and it is shown that,in specimens from which the volatile component is removed, the concentration of vacant nodes differs little from the equilibrium concentration. There are 6 figures and 7 references, 5 of which are Slavic.

Card 2/2

SUBMITTED: July 18, 1956.
ASSOCIATION: Kharkov State University imeni A. M. Gorky.
(Khar'kovskiy Gosudarstvennyy Universitet imeni A.M. Gor'kogo)
AVAILABLE: Library of Congress

AUTHOR: Geguzin, Ya. Ye. 126-5-3-19/31

TITLE: On the Excess Vacancies in Metals of Galvanic Origin (Ob izbytochnykh vakansiyakh v metalle gal'vanicheskogo proiskhozhdeniya)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1957, Vol 5, Nr 3, pp 536-544 (USSR)

ABSTRACT: The problem is considered of the excess vacancies in metals of galvanic origin on the basis of kinetic data on their coagulation and on the kinetics of volume compression (sintering) of porous powder presslings. The process of formation of macroscopic pores during sintering of a metal with a highly distorted crystal lattice was investigated on copper of galvanic origin, precipitated from an acidic bath onto a copper plate which was rubbed by a finely dispersed graphite so as to enable easy removal of the deposited copper from the base, the current density was about 5A/dm^2. To detect the formation of macroscopic pores the specimens were annealed at 500, 700 and 900°C for one hour in a vacuum furnace. Fig.1, p.538, shows photos of the typical structures observed before and after annealing and they show clearly the fact that macroscopic pores form. The experimental data obtained on the

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Excess Vacancies in Metals of Galvanic Origin

Kinetics of growth of macroscopic pores under conditions of isothermal annealing can be utilised for evaluating the degree of saturation of a metal by vacancies. For following the kinetics of growth of the pores, three series of isothermal annealings were carried out at 500, 750 and 1000°C respectively with maximum durations of twenty hours at 500°C, 12 hours at 750°C and 10 hours at 1000°C. Typical structures observed on the specimens annealed at 1000°C are reproduced in Fig.3, p.540. In Fig.4 the dependence is graphed of the average pore dimension on time for isothermal annealing at 1000, 750 and 500°C respectively. The phenomenon of appearance of macroscopic pores was detected during annealing of copper of galvanic origin. It was found that, fundamentally, the pores are distributed at the grain boundaries which is attributed to impeded intergranular recrystallisation of the metal of galvanic origin. The obtained experimental data on the kinetics of growth of the pores were utilised for evaluating the magnitude of the saturation of the lattice with vacancies. The magnitude of the relative saturation with vacancies of copper powders of galvanic

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On the Excess Vacancies in Metals of Galvanic Origin 126-5-3-19/31

origin was evaluated according to test data obtained in sintering powder presslings. The determined values of saturation and the kinetics of the change of the magnitude $\Delta V/V_0$ of the Zener formula are in agreement with the conceptions expressed in earlier work of the author and Pines, B. Ya.(Ref.5) that the excess vacancies in the crystal lattice are caused by "healing" of micro-distortions of the lattice.
There are 6 figures and 14 references, 11 of which are Soviet, 3 English.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet (Khar'kov State University)

SUBMITTED: October 31, 1956

Card 3/3

1. Metals--Porosity 2. Metals--Structural analysis 3. Crystals --Lattices 4. Crystals--Distortion

AUTHOR: GEGUZIN, YA.E.

TITLE: Diffusion Porosity in Metals and Alloys. (Diffusionnaya poristost' v metallakh i splavakh, Russian). PA - 2286

PERIODICAL: Uspekhi Fiz.Nauk, 1957, Vol 61, Nr 2, pp 217-247 (U.S.S.R.)

ABSTRACT: Received: 4 / 1957 Reviewed: 5 / 1957

The present survey discusses essentially the experimental investigations of the creation of diffusion porosity and some phenomena connected therewith. The survey is arranged as follows:
The diffusion porosity occurring on the occasion of the reciprocal diffusion of metals which form solid substitute solutions: Reciprocal diffusion of such metals, the rules governing the occurrence of diffusion porosity. Granulation of the pores. Modification of the volume of the diffusion sample on the occasion of the diffusion process. Evaporation of volatile components from the alloy.
Diffusion porosity in monocomponent systems:
Oversaturation of a crystal lattice with vacancies: Oversaturation with vacancies which occur on the occasion of reciprocal diffusion in solid substitute solutions. Concentration of excess vacancies in monocomponent systems.
The forming of diffusion pores: The critical germ of diffusion pores (of negative crystals). The significance of admixtures on the occasion of the forming of diffusion pores.

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Diffusion Porosity in Metals and Alloys. PA - 2286

Diffusion porosity and vanishing of admixtures consisting of metal

solutions. Totality of the experimental facts discussed in this survey indicates the following: A diffusion porosity occurs in the case of many processes which take place in crystalline (metallic or non-metallic) systems. In all cases investigated (in the case of diffusion homogenization, elimination of distortions, coagulation of microcavities etc.) the creating of diffusion porosity is a stage on the way towards the occurrence of the real state of equilibrium in the sample.
The diffusion porosity with which a very highly developed system of additional inner surfaces is connected is able to determine in a high degree the kinetics of phase transformations in the crystal system. According to the author's opinion this is one of the reasons why the creation of diffusion porosity should continue to be investigated. (18 illustrations and 3 tables).

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

Card 2/2

GEGUZIN, Ya. Ye.: Doc Phys-Math Sci (diss) -- "Experimental investigation of some physical processes occurring in sintering and creep of metals and alloys". Khar'kov, 1958. 17 pp (Min Higher Educ Ukr SSR, Khar'kov Order of Labor Red Banner State U im A. M. Gor'kiy), 150 copies (KL, No 6, 1959, 122)

SOV/120-58-6-30/32

AUTHORS: Geguzin, Ya. Ye. and Obcharenko, N. N.

TITLE: Application of the Adsorption Pump in High-Temperature Metallographic Investigations (Ob ispol'zovanii adsorbtsionnogo nasosa pri vysokotemperaturnykh metallograficheskikh issledovaniyakh)

PERIODICAL: Pribory i tekhnika eksperimenta, 1958, Nr 6, pp 117-118 (USSR)

ABSTRACT: The authors employed an adsorption pump for the outgassing of the working chamber of a high-temperature metallographic microscope; the pump was developed and investigated in the Cryogenic Laboratory of the Physics Engineering Institute of the AS Ukrainian SSR. It is thought that the use of the pump in such investigations is very desirable, in view of its characteristics; thus the operating region is known to be free from oil and mercury vapours, since the outgassing is done without employing a liquid; consequently, the pumping velocity of the device increases with the increase of pressure in the outgassed space, which is important at high temperatures where various metal components can give off their occluded gases. A microscope fitted with an adsorption pump is shown

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Application of the Adsorption Pump in High-Temperature Metallographic Investigations

in Fig.1. In this, the working chamber 1 is in the form of a cylinder having a volume of 1 litre. The pump is welded to the bottom of the chamber, and is in the form of a tube 2 having a length of 300 mm, and a diameter of 30 mm. The tube contains a cylindrical grid having a diameter of 12 mm. The space between the grid and the tube is filled with grains of activated carbon. The instrument is first evacuated by means of a fore-vacuum pump. This pump is then switched off and the tube of the adsorption pump is placed in a Dewar vessel containing liquid nitrogen. In about five minutes, the pressure in the instrument is reduced to 5×10^{-6} mm Hg. The paper contains 1 figure and 2 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut khimii KhGU (Scientific Research Institute for Chemistry of the Kharkov State University)

SUBMITTED: December 21, 1957.

GEGUZIN, Ya.Ye. [Hehuzin, IA.IE.]; OVCHARENKO, N.H.

Effect of "impurities" on production of diffuse porosity. Ukr. fiz.zhur. 3 no.5:696-698 S-O '58. (MIRA 12:2)

1. Khar'kovskiy gosudarstvennyy universitet i nauchno-issledovatel'skiy institut Khar'kovskogo gosudarstvennogo universiteta.
(Ionic crystals)

SOV/126-6-4-11/34

AUTHOR: Geguzin, Ya.Ye.

TITLE: Investigation of Sintering of Metal Powders at Constant Rate of Heating (Issledovaniye spekaniya metallicheskikh poroshkov pri postoyannoy skorosti nagreva)

PERIODICAL: Fizika metallov i metallovedeniye, 1958, Vol 6, Nr 4, pp 650-656 (USSR)

ABSTRACT: Numerous attempts have been made in the recent years to derive expressions that would adequately describe the process of sintering (Ref.1-5) in terms of the linear shrinkage of the sintered metal powders. However, the laws postulated on the basis of assumedly isothermal experimental curves were misleading since they did not take into account changes that had occurred while the sintered material was heated to the test temperature, apart from the fact that some of the derived equations contained constants which had no physical meaning. It is well known that the diffusion coefficient is a structure-sensitive characteristic and that the order of its magnitude may be increased 2-4 times in the presence of lattice defects. Since in the course of

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Investigation of Sintering of Metal Powders at Constant Rate of Heating

heating to a given test temperature the number of lattice deffects is decreased, which in turn causes variation of the diffusion coefficient, ths results of any investigation of a diffusion process occurring under isothermal experimental conditions in a material with a distorted crystal lattice will be affected by the rate of heating. This fact is illustrated by the results of experiments in which two identical metal powder compacts were sintered isothermally at 960°C having attained this temperature at two different rates of heating (Fig.1): It is obvious that the "isothermal" curves obtained in these two cases are described by quite different kinetic equations. These considerations have led the present author to believe that the kinetics of shrinkage during sintering should be studied continuously in the course of the whole of the heating cycle and since the way of varying the temperature, T, with time, t, which is simplest and presents least experimental difficulty, corresponds to dT/dt = const,

Investigation of Sintering of Metal Powders at Constant Rate of Heating

all tests in the course of the present investigation were carried out at various constant rates of heating. The results of the experiments in which dilatometric measurements were taken on pressed, copper powder (particle size - 40 μ) compacts (initial porosity - 40%) sintered in hydrogen at constant rates of heating ranging from 5 to 0.05°C/sec are reproduced on Fig.2 in the form of graphs showing the time-dependence of the relative shrinkage ($\Delta L/L_o$) of the specimens. Each of these curves (except one corresponding to the lowest rate of heating) was characterised by a deflection point. One of the possible causes of these deflection points might have been a decrease of the number of pores in the pressings. However, since it was found that the temperature at which they occurred did not depend on the initial porosity of pressings tested specially to check this point, it was concluded that they were caused by a decrease of the "activity" of the powder particles, a property whose qualitative

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measure is the self-diffusion coefficient D_i. To get a clearer picture of the laws governing the investigated phenomena, graphs of the temperature dependence of $\Delta L/L_0$ (Fig.4) and $d\frac{\Delta L}{L_0}/dT$ (Fig.5) were constructed. The character of the relationship between the position of the deflection points and the rate of cooling, w, is shown clearly by the graphs on Fig.5: With decreasing w the maximum on these curves is shifted towards the higher temperature values. The fact that there is no maximum on the graph corresponding to w = 0.05°C/sec indicates that in this case deflection point is situated above 1000°C. On the basis of the well known equation describing the kinetics of linear shrinkage in sintered powder pressings (Eq.4) and graphs of the temperature dependence of $\Delta L/L_0$ (Fig.4), graphs of the temperature dependence of the self-diffusion coefficient D were also constructed. It was shown that (i) Unlike the case of undistorted crystal lattice

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for which $D \sim e^{-\frac{\theta}{RT}}$, the effective self-diffusion coefficient in the crystal lattice of "active" (electrolytic) powders is not a monotonic function of the temperature. (ii) The higher the rate of heating, the higher value of D is attained at any given temperature. (iii) With increasing w, the maximum on curves $D = \varphi(T)\big|_{w = \text{const}}$ is displaced towards the temperature values. It has been shown by Pines (Ref.5,6) that a basic characteristic of the processes associated with the removal of lattice defects consists of a temporary excess of vacant lattice sites. Since, according to the present views on the vacancy mechanism of self-diffusion, the self-diffusion coefficients of atoms, D_a, and vacancies, D_b, are connected by a relationship $D_a = \xi D_b$ (Ref.9), where ξ = vacancy concentration, it is possible that one of the principal causes of the comparatively high values of D in 'active' powders is the fact that the actual vacancy

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Investigation of Sintering of Metal Powders at Constant Rate of Heating

concentration, ξ, is higher than the equilibrium concentration, ξ_0. Prompted by these considerations, the present author used the experimental data on the kinetics of shrinkage during sintering to study the degree of vacancy supersaturation of the lattice and the kinetics of the process by which the equilibrium concentration is attained. To this end, expressions for the relative supersaturation of the lattice ($\Delta\xi/\xi_0 = \frac{\xi - \xi_0}{\xi_0}$) as a function of the rate of heating w (Equ.9) and temperature T (Eq.10) were derived and the appropriate graphs (Fig.7 and 8) constructed. In agreement with the experimental results obtained by the present author when studying the kinetics of coalescence of excess vacancies (Ref.7), the curves of the temperature dependence of $\Delta\xi/\xi_0$ show that the higher the rate of heating the higher is the degree of supersaturation at a given temperature and that for any given w the relative supersaturation decreases with rising temperature. The results of the present investigation

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indicate that the vacancy concentration in sintered, electrolytic copper powder pressings exceeds the equilibrium concentration even when slow rates of heating ($w = 0.05^{\circ}C/Sec$) are employed and temperatures near the melting point are reached. Similar conclusions were reached by the present author and his co-workers in another investigation described elsewhere (Ref.3). There are 8 figures and 10 Soviet references.

ASSOCIATION: Khar'kovskiy Gosudarstvennyy Universitet (Khar'kov State University)

SUBMITTED: 26th February 1957.

SOV/126-6-5-10/43

AUTHOR: Geguzin, Ya.Ye.

TITLE: Investigation of Creep in Metals and Alloys (Issledovaniye kripa metallov i splavov) Part II. The Influence of Distortion Removal on the Kinetics of the Initial Stage of Creep of Metals Having a Distorted Crystal Lattice (II. O vliyanii protsessa snyatiya iskazheniy na kinetiku nachal'noy stadii kripa metallov s iskazhennoy kristallicheskoy reshetkoy)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 5, pp 825 - 831 (USSR)

ABSTRACT: In the case of small loads, the kinetics of creep can be worked out from the speed of the diffusion displacement of atoms, as the activation energy of self-diffusion and creep coincide. Therefore, it can be assumed that the factors influencing the self-diffusion of metals also influence the kinetics of creep. The coefficient of self-diffusion, being extremely structure sensitive, shows up in minute changes occurring in the crystal lattice. In the work described in this paper, the early stages of creep in copper having a heavily distorted lattice were studied with a view to obtaining information about the kinetics of the healing of distortions. Experiments were carried out on plastically

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Investigation of Creep in Metals and Alloys. Part II. The Influence of Distortion Removal on the Kinetics of the Initial Stage of Creep of Metals Having a Distorted Crystal Lattice

deformed and electrolytic copper. The research apparatus is shown digrammatically in Figure 1. The heating element consists of a quartz tube around which nichrome wire is wound and which is covered with asbestos. The temperature gradient along the specimen length is only about 1°, which is achieved by uneven winding and by a long copper tube placed inside the quartz tube. The elongation of the specimen is measured by means of the "mirror and scale" method. A small iron rod, being the load, which is free to slide up and down inside a test-tube, is controlled by a solenoid fixed at the bottom of the test-tube. The specimens were plastically-deformed 0.5 mm wire and thin strip of electrolytic copper. All measurements were carried out in a vacuum of 10^{-2} to 10^{-3} mmHg col. The various loads used (0.45 to 7 kg/cm^2) were all below the creep limit. All experiments were carried out at a constant heating rate. The effective toughness was worked out from the relationship:

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$$\eta = \frac{p}{\frac{d}{dt}\left(\frac{\Delta L}{L_o}\right)_w}$$

where p - specific load, w - rate of heating and $\Delta L/L_o$ - relative elongation. On heating a loaded specimen, the lattice of which is distorted, the relationship $\Delta L/L_o = \varphi(T)$ begins to deviate at a certain temperature from the usual "heat course" associated with heat expansion. This deviation is due to creep. The first series of experiments is concerned with an investigation of the extent of deviation of the elongation of the specimen from the "heat course" and the dependence of the temperature at which this deviation commences on the degree of lattice distortion. The general nature of this relationship is

Investigation of Creep in Metals and Alloys. Part II. The Influence of Distortion Removal on the Kinetics of the Initial Stage of Creep of Metals Having a Distorted Crystal Lattice

illustrated by strain-time curves for a powder metallurgical copper specimen (see Figure 2), in which the specimen was tested after annealing at various temperatures. The higher the annealing temperature, the higher the temperature at which deviation from the "heat course" commences on subsequent straining. Similar experiments with a plastically deformed copper specimen (see strain-temperature curves, Figure 3) led to the following conclusions:

a) the elongation obtained in addition to that due to heating is associated with creep and is greatest for the first heating, decreasing with increase in the number of subsequent heatings;

b) the temperature at which creep becomes evident increases with repeated heating.

Further experiments were carried out with electrolytically deposited copper in order to study the relationship between the degree of lattice distortion and creep. By varying the current density of deposition, different degrees of lattice

Investigation of Creep in Metals and Alloys. Part II. The Influence of Distortion Removal on the Kinetics of the Initial Stage of Creep of Metals Having a Distorted Crystal Lattice

distortion are obtained, the latter increasing with increasing current density. The results are represented in the diagram, Figure 4, which confirm the fact that the greater the distortions of the lattice the lower the temperature at which creep commences and the greater the degree of elongation. Electrolytically produced specimens fail in high-temperature creep tests by intercrystalline fracture. This is due to formation of vacancies which reduce the cross-sectional area of the specimen. The object of this second series of experiments was to study the influence of the heating rate of deformed specimens on elongation due to diffusion creep. The results obtained are given graphically in Figure 5 in which the curves show that the relative elongation increases with decrease in heating rate. From Figure 6, in which the effective toughness is plotted against temperature, it can be seen that as the heating rate up to a certain definite temperature is increased, so the yield strength at that temperature increases. The curves obtained for the kinetics of stepwise

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heating with an isothermal soaking time at each step of 20 min (Figure 7) are similar to those described by Pines et al (Figure 3). Besides, X-ray photographs were taken of deformed and electrolytic copper specimens in order to study the relation between recrystallisation and heating temperature (Figure 8). By comparing these X-ray photographs with the creep curves, it is possible to conclude that the collective recrystallisation taking place in a deformed specimen during heating does not fully remove the cause responsible for the increase in creep rate. This cause may be a network of cracks (Ref 12) present in electrolytic metal, or developing in deformed metal. As the grains coarsen, the microcracks in the lattice may be preserved and may cause an increased creep rate at temperatures at which growth of recrystallised grains becomes evident.

There are 8 figures and 12 references, 11 of which are Soviet and 1 English.

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SOV/126-6-5-10/43

Investigation of Creep in Metals and Alloys. Part II. The Influence of Distortion Removal on the Kinetics of the Initial Stage of Creep of Metals Having a Distorted Crystal Lattice

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo (Khar'kov State University imeni A.M. Gor'kiy)

SUBMITTED: February 25, 1957

Card 7/7

SOV/137-59-5-10207

Translation from: Referativnyy zhurnal, Metallurgiya, 1959, Nr 5, p 107 (USSR)

AUTHOR: Geguzin, Ya.Ye.

TITLE: On the Phenomenon of "Growth" in Sintering Intersoluble Metal Powders

PERIODICAL: Uch. zap. Khar'kovsk. un-t, 1958, Vol 98, Tr. Fiz. otd. fiz.-matem. fak., Vol 7, pp 267 - 273

ABSTRACT: Experimental investigations were carried out into the temporary dependence of the magnitude of linear shrinkage in sintering pressed products of Cu-Ni powders and their 50% mixtures. Results of measurements were used to calculate the magnitude of "growth" on an A - B type contact. The dependence of this value on the initial porosity of the pressed products is shown. The presence of "internal" free volume in the porous pressed product caused reduced "growth", which was dilatometrically measured. The author analyzed the problem on the possible inhibition of the "growth" by a mixture of interdiffusing metal powders.

I B

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AUTHOR: Geguzin, Ya. Ye. SOV/20-120-4-36/67

TITLE: On the Activation Energy of the Diffusion Creep of Metallic Disordered Solid Substitute-Solutions (Ob energii aktivatsii protsessa diffuzionnoy polzuchesti metallicheskikh neuporyadochennykh tverdykh rastvorov zameshcheniya)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 4, pp. 819 - 822 (USSR)

ABSTRACT: The experimental data on the irreversible deformation of metals at high temperatures and stresses (if the velocity of extension is proportional to stress, $\dot{\varepsilon} \sim P$) can quite satisfactorily be explained by the mechanism of diffusion. These conceptions base upon the following idea: The macroscopically observed flow is the consequence of a directed stream of vacancies which is due to autodiffusion. This stream forms under the influence of the gradient of the concentration of vacancies. There are 3 independent methods of determining the activation energy of the diffusion creep of disordered solid substitute solutions: a) From the data on the temperature dependence of the coefficients of the autodiffusion of the solution components in a solution of given concentration. b) From the heat of fusion of the

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components of the solution, and from the difference $\Delta u_o = u_o^I - u_o^{II}$, which is determined from the diagram of equilibria. u_o^I resp. u_o^{II} denote the energy of mixing per particle in the liquid and solid phase respectively. c) By experiment from the temperature dependence of the velocity of the diffusion creep of the disordered solid substitute-solutions of given concentration. These 3 methods can be verified on the basis of the example of the system Au - Ni. The verification of the methods a) and b) is discussed in short. Both methods lead to the same results. The authors also carried out creep experiments with samples of the alloy Au - Ni (50 - 50 atom per cent) at 800, 860 and 920°. The activation energy of the diffusion creep was found to be $(45 \pm 2).10^3$ cal/mol. This experimental value agrees satisfactorily with the theoretically computed ones. The authors finally give the theoretical and experimental values of the activation energy of the diffusion creep for the systems Cu - Ni and Pb - Sn. There are 1 figure, 1 table, and 15 references, 11 of which are Soviet.

On the Activation Energy of the Diffusion Creep of Metallic Disordered Solid Substitute-Solutions SOV/2o-12o-4-36/67

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet im. A. M. Gor'kogo (Khar'kov State University imeni A. M. Gor'kiy)

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

SUBMITTED: January 10, 1958

1. Metals--Deformation 2. Metals--Creep 3. Metals--Stresses 4. Diffusion--Theory 5. Mathematics

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24(0) SOV/25-59-2-4/48

AUTHOR: Geguzin Ya.Ye., Candidate of Physico-Mathematical Sciences (Khar'kov)

TITLE: An Important Problem (Vazhnaya Problema)

PERIODICAL: Nauka i zhizn', 1959, Nr 2, p 11 (USSR)

ABSTRACT: The article concerns the Vsesoyuznoye nauchnoye soveshchaniye po voprosam fiziki prochnosti (All-Union Scientific Conference on Problems of the Physics of Solid Bodies), held at the Khar'kov State University from 26 to 28 Nov 1958. The conference was attended by more than 200 scientists and engineers of Moscow, Leningrad, Sverdlovsk, Kiyev, Khar'kov, Kuybyshev and other Soviet cities. The academician G. V. Kurdryumov, who opened the conference, drew the attention of the audience to the fact that the problem of the physics of solid bodies (neglected during the post-war years), is

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An Important Problem

now the focus of interest of many scientific research institutes. This interest is explained by the new tasks arising in connection with the development of atomic engineering, space flights and the urgent need for materials which are highly stable within a wide range of temperature. One of the most interesting problems discussed at the conference was the problem of stability of solid bodies under pressure. A number of reports were dedicated to this problem, which clearly indicated that microscopic flaws in the solid body considerably reduce its stability and that the "lifetime" of the object under pressure is also reduced by an increase of temperature. On the whole, 45 reports were delivered at this conference, which was attended by a large number of young physicists.

SOV/70-4-4-18/34

AUTHORS: Geguzin, Ya.Ye. and Shpunt, A.A.

TITLE: The Investigation of the Process of High-temperature Self-healing of Macro-defects on the Surfaces of Single Crystals of Rock Salt

PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 4, pp 579-586 (USSR)

ABSTRACT: Details of the levelling of the surface of a single crystal of NaCl which occurs at high temperatures (up to 790 °C) have been observed and described. Using microscopic and interferometric methods the healing of artificially produced defects in the form of grooves of definite geometry has been observed. It is shown that the process of self-healing of grooves proceeds with a speed diminishing with time. It is found that the distortion of the crystal lattice promotes the acceleration of the process of the high-temperature healing of the defect. It is further shown that transport of material in the gaseous phase substantially determines the kinetics of the high-temperature healing of macroscopic surface defects.

The grooves were made with a diamond pyramid from a microhardness tester. The angle between opposite faces was

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136° and various loads were used. Material from the groove was displaced into a ridge either side of it and a calculation of the energy in the groove is made. The contours of the grooves were plotted at intervals with an interferometer. Acknowledgments are made to V.I. Startsev. There are 9 figures and 8 references, of which 6 are Soviet and 1 German, 1 English.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy institut khimicheskikh reaktivov "IREA" Khar'kovskiy filial (All-Union Scientific Research Institute for Chemical Reagents "IREA", Khar'kov Branch)

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SOV/126-7-1-10/28

AUTHOR: Geguzin, Ya.Ye.

TITLE: Investigation of Creep of Metals and Alloys (Issledovaniye kripa metallov i splavov) III. The Effect of the Specific Load on the Kinetics of the Initial Stage of Creep in Metals With a Defective Crystal Lattice (III. O vliyanii velichiny udel'noy nagruzki na kinetiku nachal'noy stadii kripa metallov s iskazhennoy kristallicheskoy reshetkoy)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1959, Vol 7, Nr 1, pp 72-78 (USSR)

ABSTRACT: The experiments were carried out using the apparatus and technique described earlier by the author (Ref.3). In the first series of tests the author studied diffusion creep of copper samples with defective crystal lattice, to which he applied different loads. On heating at the rate of 5°C/min diffusion creep of identical plastically deformed copper samples was studied under loads of 3.25 and 5.75 kg/cm^2. The results obtained are shown in the form of temperature dependence of the extension per unit load (Fig.1) and viscosity (Fig.2). Similar experiments were made on copper

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Investigation of Creep of Metals and Alloys III. The Effect of the Specific Load on the Kinetics of the Initial Stage of Creep in Metals With a Defective Crystal Lattice

samples of electrolytic origin. The results are shown in Figs.3 and 4: Figure 3 gives the time dependence of the extension per unit load, and Fig.4 shows the extension, and the extension per unit load as a function of the applied load. In the second series of tests the author studied diffusion creep both under the conditions of uniform rise of temperature and when temperature was held constant for long periods. The results for plastically deformed copper samples are shown in Fig.5 in the form of dependence of extension on time. Figs. 6 and 7 show the time dependence of the extension per unit load for copper samples of electrolytic origin. The results obtained show that small loads, below the elastic limit, produce healing of defects similar to healing produced by an increase of temperature. This effect is due to a transformation of dislocations, under an applied external load, to dislocations of the type which are more easily healed by thermal fluctuations. Acknowledgments are made to I.M. Lifshits and M.I. Kaganov for their advice. There are 8 figures and 8 references, of which 5 are Soviet and 3 English.

SOV/126-7-1-10/28

Investigation of Creep of Metals and Alloys III. The Effect of the Specific Load on the Kinetics of the Initial Stage of Creep in Metals With a Defective Crystal Lattice

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet imeni A.M. Gor'kogo (Khar'kov State University imeni A.M. Gor'kiy)

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SOV/126-7-2-11/39

24(6), 18(7)

AUTHORS: Geguzin, Ya. Ye. and Kudrik, V. I.

TITLE: Investigation of the Creep of Metals and Alloys (Issledovaniye kripa metallov i splavov). 4. Creep of Lead-Base Alloys (Krip splavov na svintsovoy osnove)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1959, Vol 7, Nr 2, pp 235-242 (USSR)

ABSTRACT: The experimental apparatus used in this work differed from the one described earlier (Ref 3) only by the fact that suspension devices were provided for two threads and with them two independent drums with mirrors. This enabled the kinetics of creep of two specimens to be observed simultaneously under identical conditions. Two specimens of the same alloy were installed in the apparatus, one specimen was thoroughly annealed and the other plastically deformed. Metals of the following purity were used as basic materials: Pb - 99.994%; Sn - 99.98%; Cd - 99.94%; Sb - 99.90%. The threads were obtained by extruding the alloys through a steel die of 0.5 mm dia. Prior to testing the threads were given a homogenizing anneal for two hours (above the testing

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temperature). The formation of the threads of 0.5 mm dia. was carried out by pressing them into ribbons of 0.1 mm thickness between two polished steel plates. The test was carried out as follows: Up to the temperature of isothermal soaking, the specimens were heated at a constant rate 5°C/min, after which they were isothermally soaked for 3.5-4 hours. A specific load of approximately 3 kg/cm^2 was applied to the specimens in the experiments, i.e. a load which is considerably lower than the elastic limit of the alloys in the temperature range at which the tests were carried out (Ref 4). In order to be able to calculate correctly the temperature behaviour (elongation as a result of thermal expansion on heating) from the curve within the coordinates $(\Delta L/L_o)$-t, experiments for the determination of the relationship between concentration and the coefficient of linear expansion were carried out for all investigated alloys, using massive (3 mm dia), thoroughly annealed specimens. As shown in the calculation, the relative error in the determination of the viscosity η was 3.5%. All the

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experiments were carried out in a vacuum of 10^{-2} to 10^{-3} mm Hg col. The following alloys were investigated:

The Pb-Cd system	Pb + 1 at.% Cd;	Pb + 3.5 at% Cd;
	Pb + 2 at.% Cd;	Pb + 5 at.% Cd;
" Pb-Sn "	Pb + 5 at.% Sn;	Pb + 20 at.% Sn;
	Pb + 10 at.% Sn;	Pb + 25 at.% Sn;
" Pb-Sb "	Pb + 1 at.% Sb;	Pb + 3.5 at.% Sb;
	Pb + 2 at.% Sb;	Pb + 5 at.% Sb.

From each experiment two curves were obtained which described the behaviour of a deformed and an undeformed specimen. On each of these curves there was one portion which corresponded to the heating period and one corresponding to isothermal soaking. In Figs 1,2 and 3 typical experimental curves are shown which were obtained in experiments with alloys belonging to various systems. In these figures the curves I refer to undeformed and curves II to deformed specimens. The curves obtained were also used for determination of the dimension of the scale and the magnitude of elongation

Card 3/6 due to creep associated with deformation. Curve III

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(Figs 1,2 and 3), which describes this contribution, has been obtained by graphic deduction from curves I and II. In Fig 4 the dependence of the toughness of a specimen in equilibrium, a) on the true concentration and b) on the relative concentration is shown. In Fig 5 the dependence of the toughness of a deformed specimen on the relative concentration is shown. In Fig 6 the dependence of Δ_η on the relative concentration is shown. In Fig 7 the relationship $\Delta L/L_0 = \varphi(t)$ for a Pb(80%)-Sn(20%) alloy at 180°C is shown: 1 - undeformed specimen annealed at 185°C for two hours; 2 - after supplementary annealing at 185°C for 5.5 hours; 3 - after supplementary annealing at 190°C for one hour. In Fig 8 curves for the dependence of t_H on the relative concentration of the solid solution are shown. In Fig 9 curves for the dependence of t_H on the true concentration of the solid solution are shown. In Fig 10 the dependence of δ_H on the

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true concentration of the solid solution is shown. As a result of their experiments, the authors have arrived at the following conclusions:
1. As the alloy element content of the solid solution increases, its deformation occurring during creep is facilitated, i.e. the effective toughness decreases whereas plastic deformation becomes more difficult.
2. From the investigated alloys it has been found that the rate of creep of the solid solution alloy, the lattice of which is in equilibrium or in quasi-equilibrium, is determined not by the true concentration of the alloy elements but by the degree of saturation of the solid solution.
3. The results of creep experiments with plastically deformed specimens are discussed on the basis of the theory of exhaustion, which occurs during dislocation creep. It has been found that, for the same degree of deformation, dislocation regions with a lower activation energy for the healing process appear in the investigated solutions as the concentration of the

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solvent element increases.
There are 10 figures and 8 references, 5 of which are Soviet, 3 English.

ASSOCIATION: Khar'kovskiy gosudarstvennyy universitet imeni A. M. Gor'kogo (Khar'kov State University imeni A. M. Gor'kiy)

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SOV/126-7-3-9/44

AUTHORS: Geguzin, Ya. Ye. and Vishnevskiy, I. I.

TITLE: Investigation of Creep of Metals and Alloys. 5. (Issledovaniye kripa metallov i splavov. 5.) Early Stage of Creep in Plastically Deformed Filaments of Pb-Sn Alloy (Rannyaya stadiya kripa plasticheski deformirovannykh nitey splava Pb--Sn)

PERIODICAL: Fizika metallov i metallovedeniye, Vol 7, Nr 3, pp 367-371 (USSR) - 1959

ABSTRACT: The present work was carried out with the aim of accurately checking the interrelation between the kinetics of healing of distortions and the kinetics of the initial stage of creep in three substitutional solid solutions. The object for investigation was a solution of tin (25 at.%) and lead (75 at.%). Such a concentration of tin is close to the limiting concentration of the α-solution at eutectic temperature, and hence it can be expected (Ref.2) that all effects associated with the influence of deformation on creep will be shown very clearly. The same method for making the specimens and carrying out measurements was used as by Geguzin et alia (Ref.2). Two series of experiments were carried out.

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Investigation of Creep of Metals and Alloys. 5. Early Stage of Creep in Plastically Deformed Filaments of Pb--Sn Alloy.

The experiments of the first series were carried out with the aim of finding the influence of the extent of initial distortion of the crystalline lattice of the solid solution on the kinetics of the early creep stage. The specimen was first plastically deformed. The experiments were carried out at a constant heating rate (Ref.3) (ω_H = 7°/min). As can be seen from Fig.1 the healing of a portion of the distortions taking place on heating causes creep to set in at higher temperatures and leads to smaller elongations of the specimen. The specimens were prepared as follows. Filaments of the alloy, obtained by drawing through a steel die of 0.3 mm diameter, were thoroughly annealed at 190°C for two hours, after which they were compressed to different degrees between polished steel plates. Measurements were carried out on specimens having the shape of strip of thicknesses: 0.18 mm (Δd = 0.12 mm); 0.13 mm (Δd = 0.17 mm) and 0.09 mm (Δd = 0.21 mm). The elongation was studied, both at constant heating rate ω_H = 5°/min (Fig.2) and

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Investigation of Creep of Metals and Alloys. 5. Early Stage of Creep in Plastically Deformed Filaments of Pb--Sn Alloy.

in isothermal treatment at 180°C (Fig.3). All experiments were carried out at a specific load of $R_{ud} = 6.2$ kg/cm^2. In Fig.4 the time dependence of $\Delta L/L_o R_{ud}$ during continuous creep of the specimens with different initial crystal lattice distortion is shown. Experiments of the second series were carried out with the aim of studying the kinetics of creep of specimens having the same lattice distortion, loaded at different rates. The heating rate was varied within the limits 0.35 - 350°C/min. In Fig.5 the relationship $\Delta L/L_o R_{ud} = f(T)$ of equally deformed specimens on heating at a constant rate is shown. The phenomena determining the nature of the curves in Fig.5 can be conveniently discussed by considering the dependence of the effective yield strength of the investigated specimens on temperature at constant heating rate. This relationship was determined from curves shown in Fig.5 with the help of the relationship (Ref.3)

$$x = \omega \frac{d}{dT}\left(\frac{\Delta L}{L_o R_{ud}}\right)$$

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Investigation of Creep of Metals and Alloys. 5. Early Stage of Creep in Plastically Deformed Filaments of Pb--Sn Alloy.

The value of $\frac{d}{dt}\left(\frac{\Delta L}{L_0 R_{ud}}\right)$ is found graphically by differentiating these curves. The dependence of x on T is expressed in the form of graphs $\ln x = \varphi(T)$ in Fig.6. As a result of the above investigations the authors have arrived at the following conclusions:-
(1) The kinetics of creep of a solid solution depends essentially on the degree of distortion of the crystal lattice of the specimen.
(2) The creep of a specimen with distorted lattice under isothermal experimental conditions is accompanied by healing of the distortions. In specimens with a given degree of initial lattice distortion the healing process is accomplished the later and the quasi equilibrium condition setting in is the further removed from equilibrium, the greater the initial deformation of the specimen.

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Investigation of Creep of Metals and Alloys. 5. Early Stage of Creep in Plastically Deformed Filaments of Pb--Sn Alloy.

(3) Experiments in which creep of specimens with a distorted crystal lattice, at various heating rates, was investigated have shown that the kinetics of distortion-removal from a solid solution is qualitatively analogous to the one observed earlier in distorted metallic powders (Ref.3, 4). The particular characteristic of this kinetics consists in the fact that the effective kinetic coefficient (in this case the effective coefficient of yield strength) is not a constant function of temperature. The non-constant nature of the dependence of the effective kinetic coefficient on temperature may be the result of the fact that the creep of an alloy is determined by essentially different mechanisms in various temperature ranges: by a dislocation mechanism at low temperatures and by a diffusion mechanism in a temperature range at which healing of dislocated regions is essentially accomplished.
There are 6 figures and 6 references, of which 4 are Soviet and 2 English.

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Kharkov State U. im A. M. Gor'kiy

SOV/126-7-4-12/26

AUTHOR: Geguzin, Ya.Ye.

TITLE: Investigation of Creep of Metals and Alloys. 6. Diffusion Creep of Binary Substitutional Solid Solutions

PERIODICAL: Fizika metallov i metallovedeniye, 1959, Vol 7, Nr 4, pp 572-585 (USSR)

ABSTRACT: According to the contemporary views on the mechanism of diffusion creep of crystalline substances (Ref 1,2,3, 5) the change of the shape of a body in creep is determined essentially by the coefficient of self-diffusion of the vacant lattice sites and, in the case of pure metals, this has been confirmed experimentally (Ref 5,6,7,12). The theory of diffusion creep has been formulated for pure metals, i.e. for single-phase crystalline systems consisting of atoms of one element and lattice vacancies and it was the aim of the present author to apply these concepts to disordered solid substitutional solutions, i.e. to single-phase, 2-component, crystalline systems consisting of two types of atoms and lattice vacancies. In his attempt to interpret the obtained experimental data on the temperature dependence of diffusion viscosity of the

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Investigation of Creep of Metals and Alloys. 6. Diffusion Creep of Binary Substitutional Solid Solutions

solutions, the author assumed that the deformation in creep, in this case is associated (like in pure metals) with a continuous flow of vacancies, and that the gradient of the vacancy concentration by which this flow is determined is a result of the action of externally applied load. To determine whether, and to what extent, the creep characteristics are related to the type of the equilibrium diagram of the metallic system (or rather to the physical constants determining the form of the equilibrium diagram), the author studied experimentally the concentration and temperature dependence of the diffusion viscosity of three systems: copper - nickel (complete solid solubility); gold - nickel (the same as before but with a minimum on the liquidus and solidus curves) and lead - tin (partial solid solubility with an eutectic). In the first part of his work, the author derives semi-empirical expressions for the concentration and temperature dependence of the viscosity coefficient of a solid solution. He starts by pointing out that change of entropy, ΔS, on melting is the

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same for all metals and substitutional solid solutions and that it is independent from concentration (Ref 8 and 9). Taking into account the latter fact, he then introduces a concept of fictitious" melting point of an alloy constituting a substitutional solid solution. This magnitude can be determined from Eq (1) from which Eq (2) is obtained. In these expressions $T_s(c)$ - "fictitious" melting point of the solution; c - its concentration; $T_s(0)$ - melting point of the solvent metal; $Q(0)$ - the latent heat of fusion of the solvent metal; $Q_k(c)$ - "configuration" heat of fusion of the solution with concentration c; ΔS - change of entropy on melting of the solvent metal. By using the known (Ref 18) formula for Q_k, an expression is derived (Equation 3) for the concentration dependence of $T_s(c)$, in which u_o^l and u_o^{ll} are the displacement energies in liquid and solid phases, respectively; Q_A and Q_B - latent heats of melting of pure metals A and B; N - number of particles. After drawing attention to the fact that the produce $\gamma = \zeta D_b$ (ζ - concentration of vacant lattice

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sites) at temperature corresponding to the "fictitious" melting point does not depend on the concentration of the solid substitutional solution and is determined only by the type of the crystal structure, the author points out that the activation energy of the process of viscous flow, Θ, and the "fictitious" melting point, T_s, of a disordered solid solution are related in the same way as in the case of pure metals, i.e. according to Eq (4), which in combination with Eq (3) becomes Eq (5). As to the relationship between the partial coefficients of self-diffusion, $D^s_A(c)$ and $D^s_B(c)$, of the components of a binary disordered solution, and the coefficient of self-diffusion of vacancies, D^s_b, it is described by Eq (6), where ξ and c are the concentrations of vacancies and atoms of component B, respectively. The concentration dependence of the calculated values of $\gamma(c) = \xi D^s_b(c)$ for the gold-nickel system at 800, 850, 900 and 950°C is illustrated in Fig 1. Curves reproduced in Fig 1 were used for plotting graphs of the relationship $\ln\gamma$ versus $(1/T - 1/T_s)$, where $T_s(c)$ - the "fictitious" melting point at a given concentration. The values of $\gamma(c)$ for

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some gold-nickel alloys at their "fictitious" melting points, calculated from these graphs, are given in Table 1. These data confirm that $\gamma(c)$ at $T = T_s$ is practically independent from concentration. The validity of Eq (5) can be checked also with the aid of data on self-diffusion in the gold-nickel system. On the assumption that, in analogy to pure metals, diffusion creep in disordered solid solutions can be described as a continuous flow of vacancies, the magnitude $\frac{1}{3} D_b^s$ in the formula describing the relationship between the viscosity coefficient and the coefficient of self-diffusion of vacancies (Eq 7) can be substituted from Eq (6) so that Eq (8) is obtained. (In Eq (7) and (8), δ - lattice parameter; R, L - the characteristic linear dimensions of the testpiece.) Since the viscosity coefficient and activation energy are related by Eq (9) it is possible to find θ (c) from the slope of the straight lines in coordinates

$$\ln \frac{D_B^s + D_A^s(1 - c)}{T} - \frac{1}{T}$$

The concentration dependence

of $\theta(c)$ determined in this way is shown in Fig 2 (continuous curve representing the results of calculation according to Eq (8) and (9); broken curve representing the results of calculations with the aid of Eq (5)). The curve in Fig 2 can be compared with the data obtained from Eq (5) by studying the magnitude of deviation of the curve $\theta = \theta(c)$ from the straight line connecting the values of the activation energy of the viscous flow of the components of the solution. According to Eq (5), this magnitude is determined by the relationship

$$L(c) = \frac{20R}{S} N(u_o^I - u_o^{II})c(1 - c)$$

The concentration dependence L(c) obtained by graphical method from curve $\theta(c)$ in the form of a straight line which corresponds to the additivity law, and the curve L(c) calculated from Eq (5), are shown in Fig 2. For plotting the curve L(c) the following values were taken for the magnitudes appearing in the Equation:

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$\Delta S = 2.3$ cal/g°C; $\Delta u = 1.2 \times 10^{-13}$ erg/particle. Comparison of the theoretical and experimental curves L(c) indicates that the relationship described by Eq (5) holds for the solid Au-Ni solution. Taking this into consideration, it is possible to obtain an expression which describes the concentration dependence of the diffusion coefficient during diffusion creep in binary solid solutions. From Eq (7), (9) and (3) and taking into account the independence of the magnitude βD_b^s from concentration (at $T = T_s$), Eq (10) is obtained. The formulae for β and α appearing in this equation are given immediately below it. Finally it is shown that the effect of an alloying addition on the variation of resistance of the solution to diffusion creep depends on the concentration of the solution. In this sense the effect of the alloying addition can be characterised by the coefficient of hardening $\lambda(c)$ determined by Eq (15), or Eq (16) derived from Eq (15) and (10). In the second part of the present paper, the results of the experimental work are reported. The creep tests were

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