

PROCESSES AND PROPERTIES INDEX

M

2

Data sheet. P. II.
 *Study of Magnesium Cadmium Alloys in the Region of the Compound Mg₃Cd. N. V. Ageev and D. L. Ageeva (*Izvest. Akad. Nauk S.S.S.R.*, 1944, Khim.), (2), 143-152. -- [In Russian]. Alloys of magnesium with 18-28% cadmium and 0-20% aluminium were studied by means of X-rays and electrical-resistance measurements. The elementary cell of the compound Mg₃Cd has dimensions four times those of the magnesium-rich solid solution, having constants $a = 6.301$, $A, c = 5.074$, $A, c, a = 0.805$. The degree of ordering in the alloys investigated was established by determining the ratio of the sum of the intensities of the superstructure lines to the ordinary structure lines. Curves showing equal degrees of ordering, equal electrical conductivities, and equal temp. coeff. of conductivity against composition revealed a closed max. in the region of the compound Mg₃Cd. On the lattice-const. curve this compound is marked by an inflection. The effect of heat-treatment on the singular points on the property curves was studied. N. A.

Also in ACTA PHYS., 21, No. 4, 1946;
 and DOK. AN, 749, No. 4, Vol. XXI, 1946

ASB-51A METALLURGICAL LITERATURE CLASSIFICATION

COMMON ELEMENTS

MATERIALS INDEX

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Ca

A study of magnesium-cadmium alloys in the region of the compound Mg₂Cd. N. V. Agreva and D. Ageeva (Kurnakov Inst. of Gen. & Inorg. Chem., Moscow). *Acta Physicochim. U.R.S.S.* 21, 749-63(1946) (in English).
 —Conclusions on this system from exptl. studies by various investigators are not in agreement. The binary-system alloys from 18 to 28 at. % of Cd with 0-2% Al, the region of greatest practical interest at present, were investigated. The alloys, prepd. under LiCl-CdCl₂ eutectic flux, were heated at 250-350° for 16 days in an evacuated glass tube, quenched, and annealed for 7 days at 115°, 9 days at 70-110°, and cooled to room temp. in 24 hrs. Elec.-resistance measurements at 25, 50, 75, and 100° were smooth curves with max. at 25 at. % Cd. Quasi-cusped curves obtained by others were due to incorrect thermal treatments. Alloys in which a solid soln. is to be transformed into a chem. compd. must be kept at a given temp. below the transition point for a period which increases with increasing difference in compn. from that of the compd. Powder photographs by the Preston method showed Mg solid solns. and a series of superlattice lines. The lattice parameter-at. compn. curves show a cusp at 25 at. % Cd with a 3.000 Å. and ϵ 5.0746. The atom arrangement was studied by detg. the ratio of the sum of the intensities of all superlattice lines to a similar sum for fundamental structure lines. Reduction of the ratios to percentage orders using a theoretical relation showed a max. at the compn. Mg₂Cd. A. Fleischer

ASS. S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

U.S. DEPARTMENT OF COMMERCE
 NATIONAL BUREAU OF STANDARDS

AGEYEV, N. V.

"Electron Density of Al and Cu Crystals," c. 1947

"Electron Density of Ni and NiAl Crystals," 1947

1ST AND 2ND ORDERS
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1ST AND 2ND ORDERS

M

4

***Agayev, N.Y.** *The Nature of the Chemical Bond in Metallic Alloys.* [In Russian.] 281 x 101 cm. Pp. 120, with 72 illustrations. 1947. Moscow and Leningrad: Izdatel'stvo Akademii Nauk S.S.S.R. (Publishing House of the Academy of Sciences of the U.S.S.R.) (6 roubles.)

(The monograph deals with the following subjects: (1) *Metals*: The bases of the electron theory; the crystal structure of metals; spheres of interaction of atoms; Brillouin zones; the magnetic properties of metals; X-ray spectral analysis; the fine structure of absorption spectra; and the distribution of electron density. (2) *Solid Solutions*: factors determining the solubility of metals; study of the spectra of solid solutions; magnetic study of solid solutions; thermochemical study of solid solutions. (3) *Intermetallic Compounds*: Mg₂Ni-type phases; NiAl₃-type phases; Laves phases; the γ phase in the Al-Mg system; γ-brass-type phases; β-brass-type phases; phases of the Au₂ and Au₂Si₃ type (superstructures).)

Evaluation B-75777

ASTM-SLA METALLURGICAL LITERATURE CLASSIFICATION

OPEN ELEMENTS
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LIST AND NO. ORDER PROCESSES AND PRIORITIES INDEX

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Experimental determination of electron density in crystals. I. Electron density in aluminum. N. V. Agreva and D. L. Agreva (N. S. Kurnakov Inst. Gen. Inorg. Chem. Acad. Sci. U.S.S.R., Moscow). *Bull. acad. sci. U.R.S.S., Classe sci. chim.* 1948, 17-28 (in Russian); *cf. C.A. 40, 4280^o*. — The curve of the at. scattering factor f as a function of $\sin \theta/\lambda$ was detd., with Cu $K\alpha$ 1.539 Å, and Fe $K\alpha$ 1.914 Å, on Al films produced by condensation *in vacuo* on glass and annealed at 150° (ensuring a grain size sufficiently fine to eliminate extinction, and absence of orientation) from microphotograms of the intensities of the reflections 111, 002, 022, and 113 with Fe $K\alpha$, under 35° and 49°, and 133, 024, and 224 with Cu $K\alpha$, under 30, 65°, and 81° 33'. abs. values of f were calcd. from the relative values by use of $f = 7.00$ (cor. 7.00) for (002). The expl. f curve at 20° is given from $\sin \theta/\lambda$ 0.2 to 0.8, with an accuracy of ± 0.05 . In order to calc. the electron d. distribution in the lattice by summation of a three-dimensional Fourier series, use was made of the procedure of Grimm, *et al.* (C.A. 32, 1874^o; 33, 467^o; and *l. et al.*)

C.A. 33, (0062^o). Summation of 130 terms of the Fourier series in the directions [101], [011] and [111], shows that at about 1.2 Å from the lattice point, the electron d. ρ falls abruptly to a value which remains const. over the whole interionic space of the lattice, av. 0.20 electrons per cu. Å.; the distribution curves of ρ are remarkably regular, mainly because of the absence of crystal orientation in the specimen. The correctness of the method of calcn. by short Fourier series is demonstrated by curves of ρ at various points of the lattice (in the direction [001]) as a function of the temp. for which f was recalcd.; the values of ρ vary with that temp. only for the lattice point itself and a point located at a distance of 0.1 of the identity period; for all points situated in the interionic space, the values of ρ are independent of the calcn. temp. The curves of ρ against the temp. are very regular at higher temps. and can therefore be extrapolated safely back to room temp.; this gives the final distribution curve. Comparison of the expl. electron d. in the interionic space, 0.20 electrons cu. Å., with the densities calcd. (from the vol. of the elementary cell) on the assumption of 3 different degrees of ionization of Al in the lattice (0.24, 0.10, and 0.09 electrons cu. Å. for Al³⁺, Al²⁺, and Al⁺, resp.), shows that the actual degree of ionization of Al in the lattice is intermediate between 2+ and 3+.

N. Thou

ASSN. S. I. A. METALLURGICAL LITERATURE CLASSIFICATION

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LA

7

Decomposition of a solid solution of silver in aluminum.
 N. V. Ageev and M. A. Skryalova (Inst. Non-ferrous Metals and Gold, Moscow). *Izvest. Sektora Fiz.-Khim. Anal. Inst. Obshchei i Neorg. Khim., Akad. Nauk S.S.S.R.* 15, no. 7 (1947). Alloys were prepd. from pure Ag and Al contg. Fe 0.23 and Si 0.03%. The melt was cast in steel molds preheated to 150-200°. The alloys used in this investigation contained 3.83-40.41% of Ag. The in-

goty were annealed for 5 days at 200-300° and hardened in cold H₂O. Up to 20% of Ag the ingots were cold rolled 45-50% and above 20% of Ag 14-15%. From these ingots were cut out test specimens which were heated for 3-4 hrs. at 510°, hardened, and aged at 100°, 150°, and 200°. These specimens were used for studying concn. decompn. by studying their hardness, electro-resistance, microstructure, and radiograms. By concn. decompn. is understood the processes which take place during the decompn. of a solid soln. at low temp. in a hardened alloy. The change in the properties with aging time is presented on curves. Two factors detd. the properties of an alloy undergoing concn. decompn. on aging. The amt. of Ag diminished in the basic solid soln. and sepn. of the excess component. A comparison between the exptl. and calcd. curves showed that the hardness of aged Al-Ag alloys was detd. primarily by the sepn. of the excess component, while the effect of the decrease in the concn. of the basic solid soln. was secondary. In the case of the electro-resistance the opposite was true. Both the hardness and the electro-resistance declined under the influence of the changes in the concn. of the solid soln. which took place on aging. Under the influence of sepn. of the excess component the hardness rose sharply while the electro-resistance decreased. An alloy contg. 8.0% of Ag had greatest practical advantages. This alloy, aged for 50 hrs. at 150°, had a Brinell hardness of 71, an increase of 94%, and a tensile strength of 20.7 kg./sq. mm., an increase of 96%.
 M. Hosh

3

CA

PROCESSING AND PROPERTIES UNIT

Experimental determination of the electron density in crystals. II. Electron density of copper. N. V. Agrey and D. I. Agreva. *Izv. Akad. Nauk S.S.S.R. (Dokl. Akad. Nauk 1948, 271 7; cf. C.A. 42, 8312).* The at. scattering factor curve was detd. at 20° for Cu condensed in a high vacuum and annealed at 300°, by means of Cu radiation under an angle of 35-40°, with a dispersion correction of 2.6, and was recalc. for 0°2θ. The electron ρ was calcd. by the same method as described previously for Al, by Fourier series up to 112 terms. The results are: in the direction [001], distance $z = 0, 0.18, 0.36, 0.54, 0.90, 1.26, 1.62 \text{ \AA.}$; $\rho = 21.3, 19.3, 14.9, 9.6, 2.6, 0.7, 0.1 \text{ electrons/cu. \AA.}$; along [011], $d = 0.25, 0.51, 0.76, 1.02, 1.28$, $\rho = 17.8, 10.3, 4.4, 1.6, 0.0$; along [111], $d = 0.31, 0.62, 0.94, 1.26, 2.19, 2.81$, $\rho = 16.3, 7.4, 2.2, 0.4, 0.6, 0.1$. In contrast to Al, ρ in Cu is distributed nonuniformly in the interionic space. The map of ρ in the (001) plane shows that each Cu atom is linked with its 12 closest neighbors by bridges of increased ρ . The distribution of ρ in the elementary cell is similar to that of Ni (Agrey and Onseva, C.A. 42, 5757g). N. Thon

ASB 51A METALLURGICAL LITERATURE CLASSIFICATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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EXPERIMENTAL DETERMINATION OF THE ELECTRON DENSITY IN CRYSTALS. III. ELECTRON DENSITY OF NICKEL. N. V. Agrey and L. N. Guseva. *Izv. Akad. Nauk S.S.S.R., Dzel. Khim. Nauk* 1948, 470-8; cf. *C.A.* 43, 31g. — The at. structure factor curve was detd., essentially by the same method as that used previously for Cu and Al, from x-ray reflections (Cu and Co radiations) on plane specimens of reduced Ni powder of $3-5 \times 10^{-4}$ cm. grain size, with conversion to abs. values by the substitution method with Al powder as standard. Electron ds. were calcd. by Fourier series for the temp. of 8000°, in the directions [001], [111], [011], [001]½, etc., and [011]½. In the interionic space, the electron d. reaches 0.5/cu. A., in the direction of shortest distance between atoms, 1.0/cu. A. The data indicate formation, around each Ni atom, of "bridges" of higher electron d., 1.0/cu. A., linking the atom with 12 nearest neighbors in directions of shortest distance. These bridges indicate presence of resonance forces between Ni atoms in the metallic state. On the basis of the electron d. in the interionic space, bonding of the Ni atoms must involve more than 2 electrons, i.e. also electrons other than the two 4s electrons of Ni. Consequently, 3d electrons also take part in the bond. This conclusion is contrary to the point of view of Mott and Jones, but is consistent with that of Pauling (*C.A.* 33, 12359). The value of the electron d. in the interionic space is evidence for the presence of cond. electrons. The nonuniform distribution of the electron d. prohibits a decision as to the degree of ionization of Ni atoms in the metal lattice. N. Thon

Also in Dok. AN³ 57, No. 1, 1948

ASS. S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

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U.S. DEPARTMENT OF COMMERCE

U.S. NATIONAL BUREAU OF STANDARDS

1934, 111, 319; see *M.A.*, 1, 382; and Sakiau and Schamray, *Z. anorg. Chem.*, 1935, 224, 388; *M.A.*, 2, 577).—R. N. B.

Magnesium-Rich Alloys of the System Magnesium-Aluminium-Manganese. N. V. Agoev, I. I. Korulov, and A. N. Khlapova (*Izv. Akad. Nauk SSSR, Ser. Khim. Nauk*, 1948, 16, (4), 130-143; *C. Abs.*, 1951, 45, 521).—[In Russian]. The purpose of the investigation was to determine the limit of solubility of Al and Mn when present together in solid Mg, to determine the boundaries of phases adjacent to the ternary solid soln., and to study the ageing properties and corrosion-resistance of the alloys. The work was carried out on Mg alloys with up to 40% Al and up to 10% Mn. At the beginning of crystn. in the Mg region there separated first the α -phase, which is a ternary solid soln. having the crystal lattice of Mg. A Mn-rich phase separated next, and is referred to as X, the compn. of which was not determined. Next came γ , which is a solid soln. having a crystal lattice corresponding to Al_2Mg_3 , and a phase having the crystal lattice of Mn. In the presence of Al, the solubility of Mn in Mg at 450° C. rose from 0.3% to 1.25-1.5% and in slowly cooled alloy from 0 to 0.5-0.8%. The hardness of the alloys increased considerably with the Al content; lowering the Mn content did not appreciably affect the hardness. Alloys within the field of ternary solid soln. contg. Al 10-14 and Mn 0.2-0.5% could be aged artificially at 150°, 175°, and 200° C., and attained a max. hardness of 90-100 Brinell. At 100° C. the alloys aged very slowly and the hardness changed insignificantly. The preferred compn. for these alloys are: Al 10-13 and Mn 0.2-0.5%; the most corrosion-resistant alloys contained Al 2-7 and Mn 0.03-1.5%.

REMARKS: THE METHOD OF DETERMINATION (Chimique, 1938 (C.A. 32, 4725^b)) is proposed for its detn., because the method gives the most satisfactory results.
Emanuel Merdinger

PROCESSES AND PROPERTIES INDEX

3

CA

Electron density of nickel. N. V. Agrey and I. N. Guseva. *Doklady Akad. Nauk S.S.S.R.* 50, 650 (1948). Electron densities along several planes were calculated by three-dimensional Fourier series from the experimental scattering factor curve obtained with finely crystalline Ni, by using Co and Cu radiation and converting to absolute values with Al powder as standard. Each Ni atom is linked with its 12 nearest neighbors by bridges of higher electron density, 1.1 electrons per cu. Å, as compared with about 0.4 electrons per cu. Å for the interionic space. The electron density distribution in the (001) plane is shown. N. Thon

A.S.B.-S.L.A. METALLURGICAL LITERATURE CLASSIFICATION

CLASSIFICATION	INDEX	DESCRIPTION	REMARKS
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97	98	99	100

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B

Experimental Investigation of Electron Density in Crystals. 4. Electron Density of NiAl. (In Russian) N. V. Agrey and T. N. Gureva. Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 225-233.

Structural factors for an alloy close to the NiAl composition were experimentally determined. Electron density is computed for six directions of the elementary nucleus of NiAl at a calculated temperature of 10,000°C. Bridges of increased electron density are observed between atoms of Ni-Al and Ni-Ni, indicating the presence of exchange forces between atoms. Data are tabulated and charted. 12 ref.

Inst. Gen & Inorg Chem. IMEM N.S. KURNAKOV, AS USSR

ASB-51A METALLURGICAL LITERATURE CLASSIFICATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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CA

Periodic law of Mendeleev and metal alloys. N. V.
Agrey (N. S. Kurnakov Inst. of Gen. and Inorg. Chem.,
Acad. Sci. U.S.S.R.). *Izvest. Sektora Fiz.-Khim. Anal.*
Inst. Obshchei Neorg. Khim., Akad. Nauk S.S.S.R. 19:
97-102(1949).--A review. M. Hosh

CA

2

Experimental study of the electron density in crystals. V.
 Electron density in magnesium silicide. N. V. Ageev and
 L. N. Guseva (N.S. Kurnakov Inst. Gen. Inorg. Chem.
 Acad. Sci. U.S.S.R., Moscow). *Izvest. Akad. Nauk S.S.S.R.,
 Ser. Khim. Nauk* 1953, 31-9; cf. C.A. 43, 6031i.—
 Abs. at. scattering factors were detd. against an Al standard,
 for a sample of Mg₂Si closest to the stoichiometric compn.
 (61.34 wt. % Mg), lattice const. = 6.338 ± 0.001 Å., by
 comparison of the reflections from the (331) plane of Al and
 the (020) plane of Mg₂Si, and from (422) of Al and (642)
 of Mg₂Si. The characteristic temp. of Mg₂Si was calcd., by
 Lindemann's equation, to 423°. The electron d. in the
 directions [100], [110], [111], and $[001]_{1/2, 1/2}$ of the elementary
 cell were calcd. for 4800°K. by three-dimensional Fourier
 series. The distribution of the electron d. in the interionic
 space is nonuniform. Along the [100] direction between Si
 ions, the d. falls to zero, which indicates absence of cond.
 electrons. Between nearest Si ions in the [110] direction
 there is an increased d. of 0.2 electrons/cu. Å., a result of
 homopolar bonds between these atoms. The same electron
 d. is found between Mg ions and between Mg and Si ions.
 In contrast to the Si ions, Mg ions show a nonsymmetrical
 distribution of the electron d. N. Thon

(CA 47 NO. 20: 10306 '53)

USSR/Metallurgy - Meetings

Aug 52

"Scientific Sessions, Conferences, and Meetings -- Meeting on the Theory of Metal Alloys," N. Kh. Abrikosov, Dr Chem Sci

Vest Ak Nauk, No 8, p 112

At a meeting at the Inst of General and Inorg Chemistry imeni N. S. Kurnakov, Acad Sci USSR, concerning metal alloys, N. V. Ageyev, Corr Mem Acad Sci USSR, presented a report "Periodic Law of D. I. Mendeleev -- Basis of the Science of Metal Alloys." Also read were reports S. T. Konobeyevskiy, Corr Mem Acad Sci USSR, on "The Nature of Combinations in Metals," and by Prof I. I. Kornilov, on "Metal Chemistry and Some of Its Problems." Plans were discussed for publication of a monograph and reference book on metal alloys.

PA 252Th7

AGEYEV, N. V.

"Nature of Solid Metallic Phases of Variable Composition," Usp. Khim. 21, No.9,
1952.

DANKOV, P.D.; IGNATOV, D.V.; SHISHAKOV, N.A.; AGEYEV, N.V., redaktor.

[Electronographic study of oxide and hydroxide films on metals]
Elektronograficheskie issledovaniia oksisnykh i gidrookisnykh
plenok na metallakh. Moskva, Izd-vo Akademii nauk SSSR, 1953.
199 p. (MLRA 6:12)

1. Chlen-korrespondent Akademii nauk SSSR (for Ageyev).
(Electronograph) (Metallic oxides)

AGEYEV, N.V.; PAVLOV, I.M.; SAMARIN, A.M.

[Problems in metallurgy] Problemy metallurgii. [Akademiku Ivanu Pavlovichu Bardinu k semidesiatiletiiu. Redaktsionnaia kollegiia: N.V.Ageev, I.M. Pavlov, A.M.Samarin. Otvetstvennyi redaktor A.M.Samarin]. Moskva, 1953. 483 p. (MIRA 7:6)

1. Akademiya nauk SSSR. 2. Chlen-korrespondent Akademii nauk SSSR. (Metallurgy)

PETROV, D.A.; AGEYEV, N.V., redaktor.

[Ternary systems] Troinnye sistemy. [Otvestvennyi redaktor N.V.Ageev] Moskva,
Izd-vo Akademii nauk SSSR, 1953. 313 p. (MLRA 6:10)
(Systems (Chemistry))

AGEYEV, N.V.

(2)

Experimental study of the electron density in crystals.
v. Electron density of Mg,Si. N. V. Ageev and L. N.
Guseva. Bull. Acad. Sci. U.S.S.R., Div. Chem. Sci.
1953, 31-9(Engl. translation).—See C.A. 46, 6893b.
H. L. H.

5/14/54

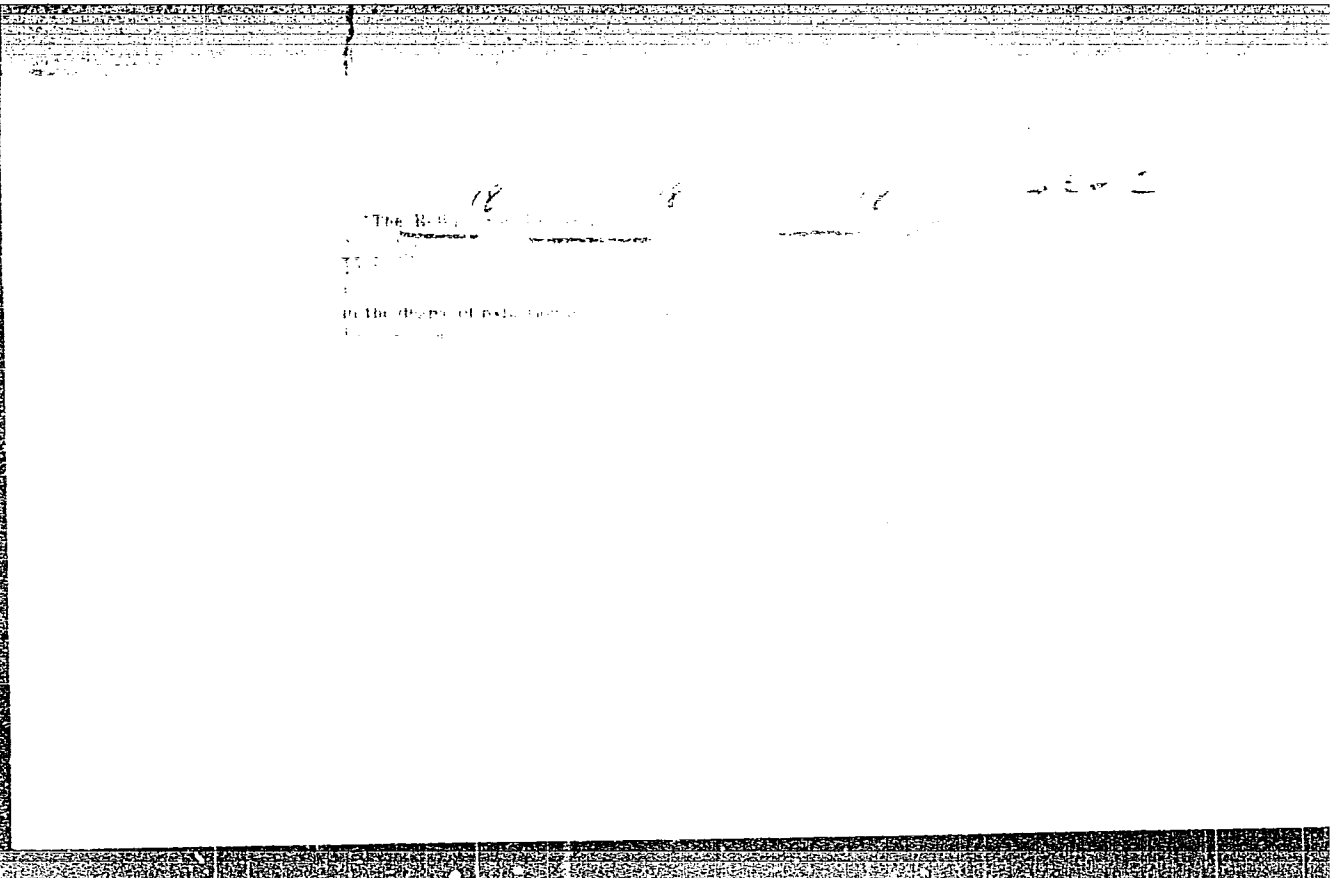
"APPROVED FOR RELEASE: 06/05/2000

CIA-RDP86-00513R000100520001-2

APPROVED FOR RELEASE: 06/05/2000

CIA-RDP86-00513R000100520001-2"

The experimental determination of the electron density in
~~Sci. Ser. N. Y. Acad. Sci. Acad. Sci. Ser. N. Y. Acad. Sci.~~
~~Abstr. Acad. Sci. Ser. N. Y. Acad. Sci. Ser. N. Y. Acad. Sci.~~
The nature of the chemical bond in ionic materials was stud-
ied by detn. of the electron d. Two methods are discussed:
detn. of the value for the atoms for the dispersion of X
rays (f' -value) and calcn. of the distribution of the electron
d. along different directions of the cryst. lattice by the Pon-
rier series. Detn. of the electron d. showed that the chem-
bond in simple substances (NaCl, MgCl₂, CaCl₂, NiCl₂)
is complex. J. Ravnitzky



U S S R .

✓ Experimental determination of the electron density in
crystals N. V. Agre, *Acta Crystallogr.* **1966**, *22*, 1000
Chem. Abstr. **1966**, 57407d

"APPROVED FOR RELEASE: 06/05/2000

CIA-RDP86-00513R000100520001-2

APPROVED FOR RELEASE: 06/05/2000

CIA-RDP86-00513R000100520001-2"

АУСЛЕВ, И. С. ИЗВ. АКАД. НАУК СССР, 1956, № 8.

"The Production and Properties of Chromium Iodide," the second article in the book Investigation of Heat-Resistant Alloys, publ. by AS USSR, Moscow, 1956, 160 pages.

Sum. No.1047, 31 Aug 56

Telesky V. Editor of book

AGEYEV, N.V.

PHASE I BOOK EXPLOITATION

364

Akademiya nauk SSSR

Prochnost' metallov (Strength of Metals) Moscow, Izd-vo AN SSSR,
1956. 205 p. 5,200 copies printed.

Resp. Ed.: Ageyev, N.V., Corresponding Member, Academy of Sciences,
USSR; Ed. of Publishing House: Rzheznikov, V.S.; Tech. Ed.:
Makuni, Ye. V.

PURPOSE: This book is a collection of articles published in honor
of I.A. Oding, a Soviet scientist, engineer and teacher whose
special fields are metallurgy and strength of metals. The book
marks his 60th birthday and the 35th anniversary of his scientific
and pedagogical work.

COVERAGE: These articles deal with experimental and theoretical
investigations of the properties and characteristics of metals.
For the abstract of each article see Table of Contents. There
is a list of 131 articles and books written by I.A. Oding.

Card 1/18

Strength of Metals

364

• TABLE OF
CONTENTS:

On the 60th Birthday of I.A. Oding, Corresponding Member of the
Academy of Sciences, USSR

7

This article is a brief biography of I.A. Oding written on the
occasion of his 60th birthday and the 35th anniversary of his
scientific work. Oding, considered a great Soviet scientist,
engineer and teacher, specialized in the field of metallurgy and
strength of metals.

Ivanova, V.S. (Metallurgical Institute of the Academy of Sciences,
USSR) On the Problem of Dislocation in Crystals During the Process
of Creep

16

Using the theory of dislocation in crystals, the author attempts
to explain the characteristics of metal behavior under creep
conditions and the increase in strength following mechanical and
thermal treatment of metals. In connection with this the author

Card 2/18

AGEYEV, N.V.

~~XXXXXXXXXXXX~~
Introductory speech at the opening of the meeting of the Metals
Section at the third All-Union Conference on Physicochemical
Analysis. Zhur. neorg. khim. 1 no.6:1358-1360 Jo '56. (MLRA 9:10)
(Metals--Analysis) (Chemistry, Analytical--Congresses)

Category : USSR/Solid State Physics - Morphology of Crystals. Crystallization

E-7

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1292

Author : Ageyev, N.V., Trapeznikov, V.A.

Title : Production of Ioditic Chromium and its Properties

Orig Pub : Issledovaniya po zharoprochnym splavam. M., AN SSSR, 1956, 17-24

Abstract : Apparatus was developed to obtain ioditic chromium by thermal decomposition of chromium iodide at 1100 -- 1150° on an incandescent tungsten filament or on quartz-glass tubes. The latter method has many advantages and results in larger amounts of chromium. The process of obtaining chromium iodide was carried out in a quartz flask at 850 -- 900° in a vacuum of 10^{-5} mm mercury. The initial material is electrolytic chromium, reduced in a stream of dry and purified hydrogen. There are practically no metallic impurities. The basic impurities are gases (principally O₂, N₂, and C, the contents of which is less than in other types of chromium). The small crystals of ioditic chromium measure 0.3 -- 0.8 mm, their microhardness is 120 -- 190 kg/mm², and the microhardness of electrolytic chromium is 150 -- 250 kg/mm². A plate of ioditic chromium can be deformed by compression to a 50% reduction in height at a deformation rate of 10 mm/min without formation of cracks. When subjected to similar conditions, electrolytic chromium cracks when compressed by 15%.

Card : 1/1

SAGEYEV, N.V.

Metallic compounds. Izv.Sekt.fiz.-khim.anal. 27:75-85 '56. (MIRA 9:9)

1. Institut metallurgii imeni A.A.Baykova AN SSSR.
(Metals)

AGEYEV, N.V.

USSR/Physical Chemistry, Thermodynamics, Thermochemistry,
Equilibriums, Phys-Chem. Anal. Phase Transitions.

B-8

Abs Jour : Ref Zhur - Khimiya, No 7, 1957, 22313.

Author : N. V. Ageyev
Inst : Not given
Title : Metallic Compounds

Orig Pub : Izv sektora fiz. khim. analiza IONKh AN USSR, 1956, 27, 75-85.

Abstract : This is a survey of contemporary ideas in the area of cry-
stallo-chemistry and of the physico-chemical analysis of
metallic compounds. Rules of valence relations in metallic
compounds are reviewed in connection with the behavior of
valence electrons in metallic phase lattices. On example of
two group metallic phases, type Mg_2Si and β phase of the brass-
type it is shown that in the first case conductivity electrons
are absent, polar forces are very feeble, phase belongs to
coordination compounds. In the second case, β -phase repres-
ents a typical berthollide (a phase of a variable composition
on the base of a chemical compound).

Card 1/1

-108-

SAVITSKIY, Yevgeniy Mikhaylovich; AGEYEV, N.V., otvetstvennyy redaktor;
MIKHEL'SON, E.M., redaktor izdatel'stva; KISELEVA, A.A., tekhnicheskiiy redaktor.

[Effect of temperature on mechanical properties of metals and alloys] Vliianie temperatury na mekhanicheskie svoistva metallov i splavov. Moskva, Izd-vo Akad.nauk SSSR, 1957. 294 p.

(MLRA 10:6)

1. Chlen-korrespondent AN SSSR (for Ageyev, N.V.)
(Metals, Effect of temperature on)

AUTHORS: Ageyev, N.V., Guseva, L.N. and Markovich, K.P. (Moscow).

TITLE: Phase transformations in chromium rich, Cr-Mo-Fe alloys.
(Fazovye prevrashcheniya v splavakh khrom-molibden-zhelezo, bogatykh khromom). 24-4-4/34

PERIODICAL: "Izv. Ak. Nauk, Otd. Tekh. Nauk" (Bulletin of the Ac. Sc.,
Technical Sciences Section), 1957, No.4, pp.23-32 (USSR).

ABSTRACT: The kinetics of the disintegration of the solid solution of 60:25:15 type Cr-Mo-Fe alloys were investigated for chromium contents of 62 and 56 wt.% respectively. It was found that at 1050°C these alloys are in the range of the α -solid solution. At 950°C both alloys undergo decomposition of the solid solution accompanied by the separation of the σ -phase of the composition Cr(MoFe); this disintegration process brings about an increase in hardness of the alloys. At the temperatures 850 and 750°C the alloy containing 62% Cr is at the boundary of the $\alpha + (\alpha + \sigma)$ phases. A decrease of the Cr concentration in the alloy to 56% leads to a disintegration of the solid solution at these temperatures. At 850°C the alloy gets hardened less than at 750°C; in the latter case a finely dispersed phase separates out during ageing. The kinetics of the disintegration of the solid solution of a 60:15:25 type alloy was investigated in the temperature range 1050-750°C; at all

Card 1/3

Phase transformations in chromium rich, Cr-Mo-Fe alloys,
(Cont.)

24-4-4/34

the temperatures separation of the σ -phase from the solid solution was observed. Increases in hardness were observed at holding times up to twenty hours. After a 100 hr holding, the hardness of the alloys dropped. The volume of the solution during the disintegration of the alloys of both types changes very little, namely, within the limits of $+ 0.002$ kX. Comparison of the kinetics of disintegration of the solid solutions type 60:25:15 and 60:15:25 leads to the conclusion that the speed of the diffusion process increases in the case of substitution in these alloys of iron for molybdenum. The high speed of the diffusion process in the 60:15:25 type alloys and their coarse grain crystalline heterophase structure at temperatures below 1000°C should lead to a deterioration of their heat resistant properties. The kinetics were studied of the ageing of a 60:25:15 alloy containing 0.07% C, 2.5% Si, 1.5% Al. It was established that in addition to the σ -phase in the temperature range $950 - 750^{\circ}\text{C}$ a finely dispersed phase rich in Mo is separated in the alloy which is probably attributable to carbides of the type M_2C_6 ; dehardening of the alloy during ageing after holding times exceeding 50 hours, is due to coagulations of this phase. Separation of the

Card 2/3

Phase transformations in chromium rich, Cr-Mo-Fe alloys.
(Cont.) 24-4-4/34

carbide phase from the solid solution leads to considerable decreases of the lattice constant of the solid solution. Introduction of titanium as an alloying element into 60:25:15 type alloys leads to an increased hardness in the temperature range 1050-750°C and no dehardening was observed in the case of long duration ageing (up to 1000 hours). Investigation of the ageing of deformed alloys of the type 60:25:15 both alloyed and non-alloyed showed that introduction of titanium reduces their speed of diffusion process. The composition in wt.% of the tested specimens is given in a small table, p.23.

Card 3/3

There are 23 figures including graphs, micro-photographs and radiographs. There are 4 American, 1 English and 1 German references.

SUBMITTED: August 6, 1956.

AVAILABLE:

Ageyev, N.V.

137-1958-2-2193

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 2, p 1 (USSR)

AUTHORS: Ageyev, N.V., Mirgalovskaya, M.S.

TITLE: The Third All-Union Conference on Physicochemical Analysis
(Tret'ye Vsesoyuznoye soveshchaniye po fiziko-khimicheskomu
analizu)

PERIODICAL: Tr. In-ta metallurgii AN SSSR, 1957, Nr 2, pp 230-232

ABSTRACT: The conference was held in Moscow on June 1-4, 1955.
Attention was given to the subjects of metal purification, the pro-
perties of rare and rare-earth metals, investigative techniques,
the physicochemical nature of phases, and to various other matters.
In the concluding resolution note was taken of a number of short-
comings in the work of the scientific research institutes.

P.N.

1. Furnaces--Characteristics--USSR

Card 1/1

1762500, 1762500

AUTHOR: AGEYEV, N.V., ARZHANYI, P.M., BARDIN, I.P., PA - 2426
BELIKOVA, E.I., BOLEUKH, A.S. BYCHKOV, V.S. VOSKOBOYNIKOV, V.G.,
GOLIKOV, I.N., et al.

TITLE: N.T. Gudtsov (Russian)

PERIODICAL: Stal', 1957, Vol 17, Nr 3, pp 281 - 282 (U.S.S.R.)
Received: 5 / 1957 Reviewed: 5 / 1957

ABSTRACT: An obituary note for N.T. Gudtsov, one of the most important Soviet scientists and metallurgists (1885 - 1957). Gudtsov obtained his high-school final certificate in Kursk 1902, finished the Petersburg Polytechnic Institute in 1910 and worked in the laboratory of the same institute with A.A. Baykov. From 1913 - 28 he was head of the metallographic laboratory in the Putilov-Works at St. Petersburg. From 1928 - 33 he was at the Leningrad Institute for Metals and founded a laboratory for the scientific research of heat treatment at the Leningrad Polytechnic Institute. He took his degree of Doctor of Technical Science in 1934. He was elected regular member of the Academy of Science of the U.S.S.R. 1939. He became one of the leading collaborators for the then founded Institute for Metallurgy of the Academy of Science of the U.S.S.R. It was he who developed the scientific thesis that under certain conditions carbon in steel can diffuse in the direction of its smaller as well as of its greater concentration.

Card 1/2

PA - 2426

N.T.Gudtsov.

He solved the problem of the formation of flakes in steel and devoted close attention to the interaction of atoms of various components in crystalline media and on the dependence of these interactions on the elasticity of the medium. The hypothesis on the atom groups which can form and decompose was worked out as a result of this research work. Investigations of the structure of hardened steel were carried out by him together with Kurdyumov and Selyakov, in the course of which work the crystalline structure of the martensite-lattice was found. His pedagogic activity began in 1915 when he held engineers' courses in the Military School for motorvehicles. Since 1943 he has occupied the professorial chair for heat treatment at the Moscow Institute for Steel. Besides, he participated in designing the Stalingrad tractor works. (1 illustrations)

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

Card 2/2

AGEYEV, N. V.

AUTHORS: Ageyev, N. V., Mirgalovskaya, M. S.
Polyakova, R. S.

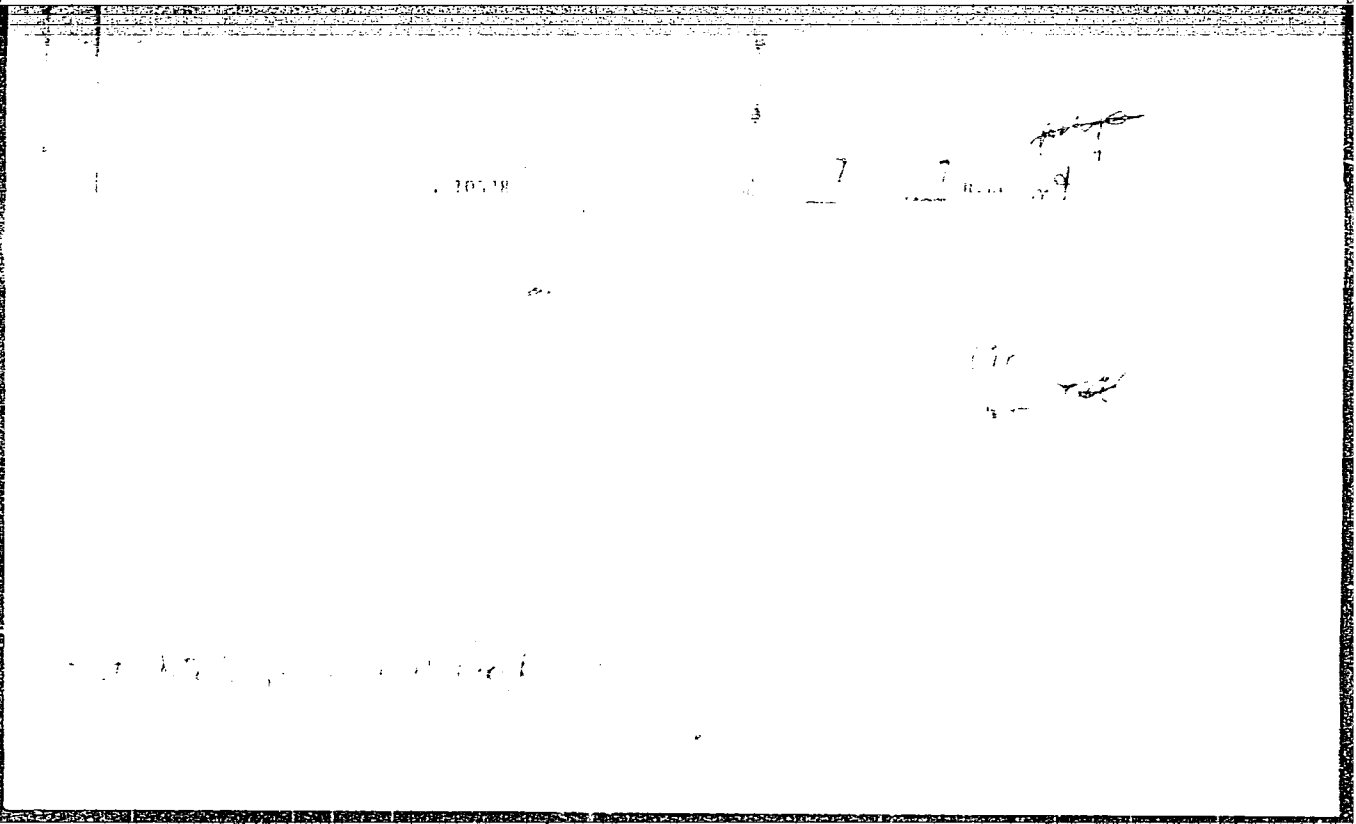
30-8-27/37

TITLE: The Investigation of the Diagrams Concerning the Quality of the Metal Systems (Issledovaniye diagramm sostoyaniya metallicheskih sistem).

PERIODICAL: Vestnik Akademii Nauk SSSR, 1957, Vol. 27, Nr 8, pp. 103-104 (USSR)

ABSTRACT: This is a report dealing with the conference held at the Baykov Institute for Metallurgy (May 17 - May 21), which was attended by numerous representatives of scientific institutes as well as by foreign guests. I. P. Bardin delivered the opening address in the course of which he gave a survey of the development of research work. The conference dealt also with material which had accumulated in other countries. Particular attention was paid to experimental results with respect to the investigation of diagrams (on the nature of systems of titanium, magnesium, aluminum, chromium, tungsten, molybdenum, as well as of the metals of the VIII group of the periodical system). The wish was expressed at the conference that a commission for coordination be attached to the Institute for Metallurgy.

AVAILABLE: Library of Congress
Card 1/1



AGEYEV, N.V., otvetstvennyy red.; RZHEVNIKOV, V.S., red. izd-va; KISELVA,
A.A., tekhn. red.

[Titanium and its alloys; physical metallurgy] Titan i ego splavy;
metallurgiya i metallovedenie. Moskva, Izd-vo Akad. nauk SSSR, 1958.
209 p. (MIRA 11:8)

1. Akademiya nauk SSSR, Institut metallurgii. 2. Chlen-korrespondent
Akademii nauk SSSR (for Ageyev).
(Titanium) (Titanium alloys)

AGEEV, N.V.

KORNILOV, Ivan Ivanovich; AGEYEV, N.V., otvetstvennyy red.; RZHEZNIKOV, V.S.,
red.izd-va; MAKUHL, Ye.V., tekhn.red.

[Nickel and its alloys] Nikel' i ego splavy. Moskva, Izd-vo Akad.
nauk SSSR, 1958. 333 p. (MIRA 11:6)

1. Chlen-korrespondent Akademii nauk SSSR (for Ageyev)
(Nickel alloys)

18(0) PHASE I BOOK EXPLANATION 809/1728

Akademiya nauk SSSR. Institut metallurgii

Sovremennyye problemy metallurgii (Modern Problems in Metallurgy) Moscow, Izd-vo AN SSSR, 1958. 640 p. 3,000 copies printed.

Resp. Ed.: A.M. Samarin, Corresponding Member, USSR Academy of Sciences; Eds. of Publishing House: V.S. Ishernikov, and A.S. Bernov; Tech. Ed.: T.V. Polyakova.

PURPOSE: This book is intended for scientific and technical personnel in the field of metallurgy.

COVERAGE: This is a collection of articles on certain aspects of Soviet metallurgy. The book is dedicated to Academician Ivas Pavlovich Samarin on the occasion of his 75th birthday. The book is divided into three parts. The first part consists of two articles presenting a brief account of the biography and professional activity of the Soviet metallurgist. It includes an article by John Chipman, Nicholas Gantsev, and John Elliott (M.I.T., USA) describing their meeting with Samarin in Moscow and also his visit to the United States. The second part consists of three articles and deals with raw materials and fuels for the Soviet metallurgical industry. The third part represents the major portion of the book. It consists of 25 articles dealing with the various aspects of the metallurgy of pig iron and steel. The fourth part consists of two articles treating the metallurgy of non-ferrous metals. The fifth part consists of three articles on the forming of metals. The sixth part consists of eight articles discussing certain aspects of physical metallurgy. This last part deals with general problems in the field of metallurgy. References are given after each article. No personalizations are mentioned.

TABLE OF CONTENTS:

Modern Problems in Metallurgy	809/1728
Kurdyumov, G.Y. [Academician, Central Scientific Research Institute of Ferrous Metallurgy]. The Nature of Martensite Transformations	546
Agapov, M.V., V.M. Bykov, and V.A. Tropashkov [Corresponding Member, AS USSR, Metallurgical Institute imeni A.A. Baykov, AS USSR, and Ferrous Metal Institute OJIM]. The Nature of Brittleness in Chrome	596
Oding, I.A. [Corresponding Member, AS USSR, Metallurgical Institute imeni A.A. Baykov, AS USSR] Structural Theory of the Creep of Metals	564
Zhil'mo Lasic [Doctor of Technical Sciences, Corresponding Member of the Academy of Sciences of Hungary, Professor]. Characteristics of Structural Steel Properties as Determined by the Work of Maximum Deformation	578

Card 11/12

AGEYEV, N.V.; PETROVA, L.A.

Stability of the beta phase in titanium-molybdenum alloys. Titan
i ege splavy no. 1:3-16 '58. (MIRA 14:5)

1. Institut metallurgii AN SSSR.
(Titanium-molybdenum alloys--Metallography)
(Phase rule and equilibrium)

AGEYEV, N.V.; SMIRNOVA, Z.M.

Stability of the beta phase in titanium-manganese alloys. Titan
i ege splayv no. 1:17-24 '58. (MIRA 14:5)

1. Institut metallurgii AN SSSR.
(Titanium-manganese alloys—Metallography)
(Phase rule and equilibrium)

AUTHOR: Ageyev, N. V.

78-3-3-2/47

TITLE: The Phase Diagram as an Expression of the Interaction Between the Atoms (Diagramma sostoyaniya kak vyrazhenie mezhatomnogo vzaimodeystviya)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3, pp. 557-561 (USSR)

ABSTRACT: The nature of the interaction between the atoms is a complicated function which not only depends on the type of atoms but also on the concentration in the reacting surroundings. In systems in which metals occur as components which possess similar chemical properties phases with variable composition may occur. Free electrons which are characteristic of metallic compounds may also occur in such phases. N. S. Kurnakov assumes that phases of variable composition can be of the type of daltonides or bertolides. The formation of daltonide or bertolide phases is dependent on the free energy of the neighboring phases. The lower the free energy in the phase to be investigated is as compared to the free energy of the neighboring phase, the stabler

Card 1/3

Doc. Metallurgy in A. A. Barykov AS USSR

The Phase Diagram as an Expression of the Interaction 78-3-3-2/47
Between the Atoms

the developing phase is. When the difference of the chemical properties of the atoms is not high, the tendency of the occurrence of a metallic binding of solid solutions prevails in the interaction between such atoms. The inclination to the formation of chemical compounds between such atoms is very small. In the solid solutions a portion of the electrons can be taken up by the atoms. They do not participate in the filling up of the energetic zones. The spreading of the solid solutions in the alloys is beside the electron-concentration also dependent on the atomic volume as well as on the mutual polarization of the atoms. The interaction between atoms, dependent on the position of the atoms in the periodic system of D. E. Mendeleev, determines the formation of certain chemical compounds, the phase of variable composition and the solid solutions. The interaction between the atoms influences the phase diagrams of the systems and the quantitative relation between the phases. There are 5 references, all of which are Soviet.

Card 2/3

AUTHOR: Ageyev, N. V.

78-3 3-25/47

TITLE: Discussion on Lectures (Obsuzhdeniye dokladov)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 3,
pp. 684-684 (USSR)

-ABSTRACT: The speaker discusses the lecture by Ya.A. Ugay in which he said that there occur deviations from the rules constructed by N.S. Kurnakov in some semiconducting systems, and that these are said to be of universal validity. He warns of such a dogmatic conception. It is known, as he said, that these rules were formed for a certain group of substances under certain external conditions. Therefore also the rules will change when the one or the other basis is changed. It is hardly to be excepted that the rules formed for metal systems remain also valid for semiconductors. Also external circumstances, as there is higher pressure, would not show the same rules as N.S. Kurnakov formed them for ordinary pressure and ordinary temperature. This is not to say that the rules formed by Kurnakov had lost their sense and their importance. Our knowledge as well as the number of substances have been essentially widened. Thus it is only natural that it

Card 1/2

Discussion on Lectures

78-3 3-25/47

is up to us to point out the changes of rules under the influence of new factors. These were new problems waiting for their solution. The values obtained were, however, of great interest just as the ones formulated by Kurnakov at his time, and there was no contradiction between them.

ASSOCIATION: Institut metallurgii im. A. A. Baykova AN SSSR, Moskva (Moscow, Institute for Metallurgy imeni A. A. Baykov, AS USSR)

Card 2/2

AGEYEV, N.V.

Discussion. Zhur.neorg.khim. 3 no.4:938 Ap '58. (MIRA 11:4)

1. Institut metallurgii im. A.A. Baykova AN SSSR, Moskva.
(Metallurgy)

AUTHORS: Ageyev, N. V., Model', M. S.

78-3-6-24/30

TITLE:

On the Determination of the Content of Gaseous Impurities in Titanium by the Amount of the Crystal-Lattice Constant (Ob opredelenii sodержaniya gazovykh primesey v titane po velichine postoyannykh kristallicheskoy reshetki)

PERIODICAL: Zhurnal Neorganicheskoy Khimii, 1958, Vol. 3, Nr 6, pp. 1439-1446 (USSR)

ABSTRACT:

The possibilities of determination of the dissolved, gaseous impurities in α -titanium by the amount of the crystal-lattice constant c by means of radiographic methods were described in the present paper. The amount of the crystal lattice constant a changes according to the quantity of oxygen. The crystal-lattice constant c of α -Ti amounts to 4,68 Å and may undergo a change of up to 4,82 Å due to oxygen contaminations which is present as a solid solution with α -Ti. The amount c can be calculated with an accuracy of up to 0,05 % by means of radiographic investigations.

Card 1/3

The action of nitrogen up to 0,15 % and of oxygen up to

On the Determination of the Content of Gaseous
Impurities in Titanium by the Amount of the Crystal-
Lattice Constant

78-3-6-24/30

0,8 % on the amount of the crystal lattice-constant c is determinable, since its influence on c takes place almost additively. With such samples, first the amount of contaminations and the concentration of oxygen is determined by the difference of samples with known nitrogen content by the determination of the amount c .

The radiographic method for the determination of the oxygen content can be successfully applied in such metal samples in which the content of metallic impurities and nonmetallic influences is almost constant. The character of the distribution of oxygen, or nitrogen in titanium metal and in the oxides of the nonmetallic inclusions can also be indicated by the determination of the crystal lattice constant c .

There are 3 figures, 3 tables, and 31 references, 1 of which is Soviet.

Card 2/3

A. B. YE. V., N. V.

18(4,7);25(1)

PHASE I BOOK EXPLOITATION

SOV/2568

Akademiya nauk SSSR. Institut nauchno-tehnicheskoy informatsii

Metallurgiya i metallovedeniye; khimiya, metallovedeniye i obrabotka titana (Metallurgy and Metallography; Chemistry, Metallography, and Treatment of Titanium) Moscow, Izd-vo AN SSSR, 1959. 383 p. (Series: Itogi nauki; tekhnicheskkiye nauki, 2) Errata slip inserted. 2,700 copies printed.

Ed.: N. V. Ageyev, Corresponding Member, Academy of Sciences, USSR; Ed. of Publishing House: V. S. Rzhazhnikov; Tech. Ed.: Yu. V. Rylyina.

PURPOSE: This collection of articles is intended for metallurgists working with titanium and titanium alloys.

COVERAGE: The articles in this collection deal with the chemistry, metallurgy, and machining of titanium and titanium alloys. The articles are based on abstracts appearing in the Referativnyy zhurnal for chemistry and metallurgy, from 1953 to 1955. For the most part the articles are based on non-Soviet material. No personalities are mentioned. References follow each article.

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Metallurgy and Metallography; (Cont.)

SOV/2568

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AG EYZU, N. U.

PHASE I BOOK EXPLANATION 304/2385

24(6)

Akademiya nauk SSSR

Laboratory problems prochnosti tvrdogo tela; sbornik statey (Some Problems in the Strength of Solids); Collection of Articles) Moscow, Izdatel'stvo AN SSSR, 1959. 386 p. Errata slip inserted. 2,000 copies printed.

Ed. of Publishing House: V. I. Artyukov; Tech. Ed. R. S. Ferman; Editorial Board: A. P. Giffa, Academician G. V. Kurdyumov, Academician S. S. Zenerov, Correspondent of the USSR Academy of Sciences; B. P. Kostomarov, Correspondent of the USSR Academy of Sciences; F. F. Vitman, Doctor of Physical and Mathematical Sciences, Professor; M. A. Elagin, Doctor of Physical and Mathematical Sciences, Professor; V. A. Stepanov, Doctor of Technical Sciences; D. B. Fridman, Doctor of Technical Sciences, Professor; R. S. Ioffe, Candidate of Technical Sciences (Deputy Resp. Ed.).

PREFACE: This book is intended for construction engineers, technologists, physicists and other persons interested in the strength of materials.

CONTENTS: This collection of articles was compiled by the Odessa Scientific Association of Physical and Mathematical Sciences (OASPM) and the Pilsudski Institute of Applied Physics, Academy of Sciences, USSR in connection of the 80th birthday of Nikolay Nikolayevich Davidenko, Member of the Ukrainian Academy of Sciences, Honorary Member of the USSR Academy of Sciences, Doctor of Physical and Mathematical Sciences, Professor, Order of Lenin, Order of the Patriotic War, and the Lenin Prize (1945) and the Order of the Red Banner of Labor (1945) and the Order of Lenin (1953). The articles deal with the strength of materials, phenomena of imperfect elasticity, creep, brittleness, hydrogen embrittlement, cold brittleness, influence of deformation speed on the mechanical properties of materials, fatigue of metals, and general problems of the strength, plasticity, and mechanical properties of nonmetals. Numerous personalities are mentioned in the introductory profile of Professor Davidenko. References are given at the end of each article.

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AGREYEV, N. V.

Ageyev, N. V., V. A. Reznichenko, T. P. Ukolova, and M. S. Model' (Institute of Metallurgy, Acad. Sci. USSR) "On the Lower Oxides of Titanium" p. 64
Titan i yego splavy. vyp. II: Metallurgiya titana (Titanium and its Alloys. No. 2: Metallurgy of Titanium) Moscow, Izd-vo AN SSSR, 1959. 179p.

This collection of papers deals with sources of titanium; production of titanium dioxide, metallic titanium, and titanium sheet; slag composition; determination of titanium content in slags; and other related matters. The sources of titanium discussed are the complex sillimanite ores of the Kyakhtinskoye Deposiy (Buryatskaya ASSR) and certain aluminum ores of Eastern Siberia. One paper explains the advantages of using ilmenite titanium slags for the production of titanium dioxide by the sulfuric acid method. Production of metallic titanium by thermal reduction processes (hydrogen, magnesium, and carbon reduction) is the subject of several papers, while other papers are concerned with the electrolytic production of titanium. Other subjects dealt with are interaction of titanium with water vapor and with hydrogen and the determination of titanium in slags.

A G E Y E V , N . V .

18(7) PHASE I BOOK EXPLOITATION SOV/3355

Andeelya nauk SSSR. Institut metallurgii. Nauchnyy sovet po
 probleme zharoprochnykh splavov
 Izvedeniya no zharoprochnym splavam, t. IV (Studies on Heat-resi-
 stant Alloys, vol. 4), Moscow Izd-vo AN SSSR, 1959. 400 p.
 Errata slip inserted. 2,200 copies printed.

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

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

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

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VOL, Abram Yevgen'yevich; AGEYEV, N.V., red.; ABRIKOSOV, N.Kh., doktor tekhn.nauk, red.; KORNILOV, I.I., red.; SAVITSKIY, Ye.M., red.; OSIPOV, K.A., doktor tekhn.nauk, red.; GUSEVA, L.N., kand.khim.nauk, red.; MIRGALOVSKAYA, M.S., kand.khim.nauk, red.; SHKLOVSKAYA, I.Yu., red.; MURASHOVA, N.Ya., tekhn.red.

[Structure and properties of binary metal systems] Stroenie i svoistva dvoynykh metallicheskiykh sistem. Pod rukovodstvom N.V.Ageeva. Moskva, Gos.izd-vo fiziko-matem.lit-ry. Vol.1. [Physicochemical properties of elements; nitrogen, actinium, aluminum, americium, barium, beryllium, and boron systems] Fiziko-khimicheskie svoistva elementov; Sistemy azota, aktinija, aliuminija, ameritsija, barija, berillija, bora. 1959. 755 p. (MIRA 13:3)

1. Chlen-korrespondent AN SSSR (for Ageyev).
(Metals) (Phase rule and equilibrium)

AGEYEV, N.V.

Titanium crystal chemistry, its compounds and alloys. Itogi
nauki: Tekh. nauki no.2:5-30 '59. (MIRA 12:9)
(Titanium) (Crystal lattices)

AGEYEV, N.V.; REZNICHENKO, V.A.; UKOLOVA, T.P.; MODEL', M.S.

Lower titanium oxides. Titan i ego splavy no.2:64-72 '59.
(MIRA 13:6)

1. Institut metallurgi AN SSSR.
(Titanium oxides)

AGEYEV, N.V.; TRAPEZNIKOV, V.A.

Preparation of pure chromium. Issl.po zharopr.splav. 4:
237-247 '59. (MIRA 13:5)
(Chromium--Metallurgy)

5(4)

SOV/78-4-3-1/34

AUTHOR: Ageyev, N. V.

TITLE: The Continuity and Discreteness of Interatomic Interaction in Crystals (Nepreryvnost' i diskretnost' mezhatomnogo vzaimodeystviya v kristallakh)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 3, pp 497-502 (USSR)

ABSTRACT: The continuity and discreteness in the chemical structure of crystals has been discussed in consideration of present assumptions regarding the interatomic interaction. The structure of the free atoms in normal condition can be determined by optical spectra and X-ray spectra. The energy state of the electrons in the crystal field can be considered a developed energetic state of the free atoms. Spectral investigations show that the sharp lines in the spectrum of the free atoms are blurred upon crystallization. Figure 1 shows the spectrographs of aluminum vapor with sharp lines and of solid aluminum at the wavelength of the X-ray spectra of the atoms in the crystals. The energy state of the free aluminum and of the combined atoms in the aluminum crystals are shown in a diagram. The crystals

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SOV/76-4-3-1/34

The Continuity and Discreteness of Interatomic Interaction in Crystals

consist of one kind of atoms and have an interatomic interaction of homopolar (discrete) and continuous (metallic) character. Crystals having different atoms can form solid solutions by heteropolar interaction. The heteropolar bonds in the solid solution depend on the chemical properties of the two kinds of atoms forming the solid solution. Crystals having different kinds of atoms with well-defined homopolar interatomic interaction form chemical compounds. Crystals having different kinds of atoms and discrete-uninterrupted interaction form compounds of varying composition. Such chemical compounds are NiAl, MgAg, CuZn. These compounds contain heteropolar, homopolar and metallic bonds at the same time. Metallic bonds promote the formation of solid solutions. There are 8 figures and 10 references, 8 of which are Soviet.

SUBMITTED: October 8, 1958

Card 2/2

'5(2), 18(4)
AUTHORS:

Ageyev, N. V., Petrova, L. A.

SOV/78-4-5-25/46

TITLE:

The Stability of the β -Phase in Titanium Alloys
With Iron and Nickel (Stabil'nost' β -fazy v splavakh
titana s zhelezom i nikelem)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 5,
pp 1092-1099 (USSR)

ABSTRACT:

The conditions for the stability of the β -phase in titanium alloys containing iron and nickel were investigated in the meta-stable state. For the purpose of producing the alloys, magnesium-thermal titanium, iodide titanium, carbonyl iron, and electrolytic nickel was used. The chemical composition of the alloys Ti-Fe and Ti-Ni is given by tables 1 and 2. The alloys were produced in an electric arc furnace with tungsten electrodes in an argon current. X-ray and microstructural analyses of the alloys and hardness- and microhardness determinations were carried out. Figure 1 shows the constructed meta-stable diagram of the phase composition of the titanium - iron alloys. The diagram shows that it is possible to stabilize the β -phase in titanium - iron alloys with 5.16 % by weight iron in the

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The Stability of the β -Phase in Titanium Alloys
With Iron and Nickel

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case of magnesium-thermal titanium alloys, and with 5.7 % by weight iron for iodide alloys by hardening in water of $+20^{\circ}$, 50° , and 900° . The meta-stable diagram of the phase composition titanium-nickel is shown by figure 2 (a - magnesium-thermal alloys; b - iodide alloys). The X-ray pictures of the titanium-iron alloys are shown by figure 4. The stability of the meta-stable β -phase of the alloys with 5.7, 6.34, 6.68 and 7.11 % by weight iron and 7.6 % by weight nickel were investigated within the temperature interval of 1196° - $+500^{\circ}$ by means of microstructural- and X-ray analyses by employing the method of determining hardness and microhardness. The structure and microstructure of alloys hardened at 900° are shown by figure 5. The diagram shows that with an increase of the iron content in the alloys the β -phase in the alloys becomes stabilized. The maximum hardness of the alloys, with 5.7 and 6.34 % by weight iron amounts to 579 and 572 kg/mm² and corresponds to the $\beta + \omega + \alpha$ -state. The maximum hardness of the alloys with 6.68 and 7.11 % by weight iron is 585 and

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With Iron and Nickel

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505 kg/mm², and corresponds to the $\beta + \omega$ -state. The structure and the hardness of the titanium alloys with 7.6 % by weight Ni, which were hardened at 900° and tempered at various temperatures, is shown by figure 6. The variation of the lattice constant of the β -solid solution of the alloys with 7.11 % by weight iron and 7.6 % by weight nickel in dependence on the heating temperature of 300° and 400°, and in the β -solid solution of the titanium alloys with 6.34 and 7.11 % by weight iron in dependence on the composition and storage time at 400° were investigated. In hardened alloys with 6.34 and 7.11 % by weight iron the lattice constants of the β -solid solutions are 3.241 and 3.216 k X respectively. The variation of the lattice constant of the β -solid solution in dependence on the composition of the alloy in the case of heating up to 400° is shown by figure 7. The variation of the lattice constants of the β -solid solution in dependence on the temperature (300 - 400°) and the time during which this temperature is maintained is

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With Iron and Nickel

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shown by figure 8. Determinations of hardness show that with a decrease of the lattice constants in the β -solid solution hardness increases. By an increase of the time of constant high temperature the hardness and the lattice constants of the β -solid solution do not change. Maximum hardness in the alloys is attained by heating up to 400°C. There are 8 figures, 2 tables, and 6 references, 2 of which are Soviet.

SUBMITTED: February 8, 1958

Card 4/4

5(2), 18(4)
AUTHORS:

Ageyev, N. V., Smirnova, Z. M.

SOV/78-4-5-26/46

TITLE:

Conditions for the Stabilization of the β -Phase
in Alloys of Titanium-Molybdenum-Manganese
(Usloviya stabilizatsii β -fazy v splavakh titan-molibden-
-marganets)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 5,
pp 1100-1105 (USSR)

ABSTRACT:

The conditions for the stabilization of the β -phase and the stability of the metastable state in three-component alloys consisting of magnesium-thermal titanium with molybdenum and manganese were investigated. For the purpose of producing the alloys, magnesium-thermal titanium, electrolytic manganese, and molybdenum were used as initial materials. The compositions of the initial materials are given in table 1. The alloys were produced in an electric arc furnace with tungsten electrodes in a helium atmosphere. The alloys were investigated by metallographical and X-ray analyses. Hardness and microhardness were determined. Figure 1 shows the phase composition of the titanium-molybdenum-manganese alloys. The phase composition of titanium-molybdenum-manganese alloys

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Conditions for the Stabilization of the β -Phase
in Alloys of Titanium-Molybdenum-Manganese

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hardened at temperatures of 700° , 800° , 900° and 1000° is shown by figure 2 (a - g). Stabilization of the β -phase in hardened alloys was investigated; a diagram was constructed and is shown in figure 3. In alloys containing a minimum of 3.76 % manganese and 26.95 % molybdenum, or 11.78 % molybdenum and 15.89 % manganese the β -phase is stabilized by hardening at 700° . In other alloys, which were hardened at 700° , the structure of the α - and β -phase is formed. In alloys with the minimum content of 3.61 % manganese and 12.81 % molybdenum and 7.63 % manganese and 1.59 % molybdenum the β -phase is stabilized by hardening at 800° . In alloys with a lower content of molybdenum and manganese the structure of the $\alpha+\beta$ -phase is formed by hardening at 800° . The microstructure of these alloys is shown by figure 4 (a - b). In alloys with 3.19 % manganese and 9.51 % molybdenum, 4.50 % manganese and 1.43 % molybdenum, 5.02 % manganese and 4.39 % molybdenum the β -phase decays by hardening at 900° , in which case the α -phase is formed.

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Conditions for the Stabilization of the β -Phase
in Alloys of Titanium-Molybdenum-Manganese

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The ω -phase was uniquely determined by X-ray analyses and by means of an electron microscope. The X-ray pictures of the alloys of titanium with 7.63 % manganese and 1.59 % molybdenum after hardening at 800° are shown by figure 5, and those of alloys of titanium with 5.02 % manganese and 4.59 % molybdenum after hardening at 900° are shown by figure 7. On the X-ray pictures the lines of the ω -phase are visible. In alloys containing 2.08 % manganese and 1.95 % molybdenum, and 3.07 % manganese and 3.74 % molybdenum the β -phase decays into the α -phase by hardening at 900°. The α -phase vanishes by hardening of the samples at a temperature of 1000°C. The stability of the β -phase when heated within the temperature interval of 100 - 600° was investigated. The microstructure of the titanium alloys containing 2.08 % manganese and 1.95 % molybdenum, hardened at 900° and 1000° is shown by figure 8. Here the occurrence of the β -phase is particularly marked. The microstructure

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Conditions for the Stabilization of the β -Phase
in Alloys of Titanium-Molybdenum-Manganese

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of hardened titanium alloys containing 7.65 % manganese and 4.43 % molybdenum after heating for 64 hours at 600° and for 64 hours at 400° is shown by figure 10. The stability of the β -phase and the variation of hardness in titanium-molybdenum-manganese alloys are shown by figure 9 (a - e). The variation of the lattice parameter and the hardness of the β -phase by heating up to 300° and 500° is shown by figure 11 (a - b). In titanium alloys with 17.87 % manganese and 4.56 % molybdenum the β -phase becomes stabilized when heated from 100 - 500° in the course of 100 hours. There are 11 figures, 1 table, and 5 references, 2 of which are Soviet.

SUBMITTED: February 11, 1958

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5(2)

SOV/78-4-7-20/44

AUTHORS:

Ageyev, N. V., Samsonov, V. P.

TITLE:

The Radiographical Investigation of the Crystal Structure of Silicides and Germanides of Titanium (Rentgenograficheskoye issledovaniye kristallicheskikh struktur silitsidov i germanidov titana)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 7, pp 1590-1595 (USSR)

ABSTRACT:

Whereas the crystal structure of $TiSi_2$, $TiGe_2$, Ti_5Si_2 and Ti_5Ge_2 is described (Refs 2,3,4), data concerning the crystal structures of $TiSi$ and $TiGe$ are still lacking. The present paper fills this gap. A description is given of the production of the melts and monocrystals and the apparatus used for this purpose (Figs 1,2). The plate-shaped $TiSi$ -monocrystals obtained are shown in figure 3. Determination of the symmetry and of the lattice constant of the elementary cell of $TiSi$ was carried out by means of the diffraction pattern (Fig 4) and a rotating crystal X-ray picture. Rhombic symmetry with the constants of the elementary cell $a = 3.61_1$, $b = 4.96_2$, and $c = 6.47_9$ kX was

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SOV/78-4-7-20/44

The Radiographical Investigation of the Crystal Structure of Silicides and Germanides of Titanium

found to exist. Density was both measured pycnometrically and also calculated on the basis of radiographical data. An elementary cell contains eight atoms. On the basis of the projection of the interatomic function on to the xy-plane (Fig 5), the Z-axis (Fig 6) and the yz-plane (Fig 7) it was possible to draw the structural model of the elementary cell (Fig 8). TiSi belongs to the space group C_{2v}^1 . Checking the structure and the atomic coordinates was carried out by comparing the experimentally found and the calculated amplitudes (Fig 9). For TiGe the following lattice constants were found: $a = 3.80_1$, $b = 5.22_4$ and $c = 6.82_0$ kX. TiGe has the same structure as TiSi. Calculation showed that TiSi and TiGe have antiisomorphous structures. For the other silicides and germanides of titanium the data found in publications were confirmed. There are 9 figures and 5 references, 1 of which is Soviet.

ASSOCIATION:
Card 2/3

Institut metallurgii im. A. A. Baykova Akademii nauk SSSR

5(2)
AUTHORS: Ageyev, N. V., Golutvin, Yu. M., Samsonov, V. P. SOV/78-4-8-26/43

TITLE: The Interatomic Interaction in the Compounds of Titanium With Silicon and Germanium (Mezhatomnoye vzaimodeystviye v soyedineniyakh titana s kremniyem i germaniyem)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 8, pp 1864-1872 (USSR)

ABSTRACT: On the basis of references 1-10 the authors give a total survey of the known compounds of titanium with the elements of the IV group (Si, Ge, Sn, Pb) (Fig 1). In the system Ti - Si the following series is set up according to the decreasing stability of the chemical bond by means of the formation heat (Fig 2), temperature dependence of the thermal capacity (Fig 3), and the minimum of the interatomic distances in the lattices (Table 1): $TiSi \rightarrow Ti_5Si_3 \rightarrow TiSi_2$. For the Ti-Ge compounds the series $TiGe \rightarrow Ti_5Ge_3 \rightarrow TiGe_2$ is obtained. In the system Ti-Sn (Table 3) only the crystal structure of Ti_5Sn_3 is exactly investigated among the four compounds Ti_3Sn , Ti_2Sn , Ti_5Sn and

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The Interatomic Interaction in the Compounds of Titanium With Silicon and Germanium

Ti_6Sn_5 . On the basis of the interatomic distances it is proved that the Ti_5Sn_3 bond is stronger than that of Ti_3Sn . The comparison of the interatomic distances in the systems Ti-Si, Ti-Ge and Ti-Sn (Table 4) shows that the substitution of silicon by germanium or tin leads to a weakening of the bond. This weakening increases with decreasing titanium content of the compound: $Ti_5X_3 \rightarrow TiX \rightarrow TiX_2$. From this the lack of titanium-tin compounds with high tin content may be explained. The comparison of the atomic volumes of the elements with the volume reduction which occurs in the formation of the systems investigated (Figs 11,12) leads to the conclusion that in the system Ti-Si electrons pass from silicon to titanium, in the system Ti-Ge the reverse process takes place, whereas no electron transition takes place between titanium and tin. Taking the free energies of the system Ti-Si (Figs 8-10) as example it is demonstrated that the formation of a peritectic is not bound to lead to a lower stability of the forming compounds. The formation of a compound due to peritectic reaction depends on the free energies of all compounds of the system

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SOV/78-4-8-26/43

The Interatomic Interaction in the Compounds of Titanium With Silicon and Germanium

concerned and on their relation to the curve of the free energy of the liquid phase. There are 12 figures, 4 tables, and 16 references, 5 of which are Soviet.

SUBMITTED: April 28, 1958

Card 3/3

5(2)

SOV/78-4-8-35/43

AUTHORS:

Ageyev, N. V., Petrova, L. A.

TITLE:

The Decomposition of the Solid β -Solution of Alloys of Titanium With Molybdenum (Raspad β -tverdogo rastvora splavov titana s molibdenom)

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 8, pp 1924-1925 (USSR)

ABSTRACT:

In the previous paper (Ref 1) the solid β -solution of a titanium alloy with 11 % by weight molybdenum was investigated and it was found that in heating to 200-400° it decomposes over a ω -intermediate phase. This intermediate phase gradually passes into the α -phase. In the heating to 500° the solid β -solution is directly converted into the α -phase. Alloys with a higher molybdenum content (15.11 and 20.93 % by weight, analyses on Table 1) were then investigated. It was found (Fig 1) that the process in these alloys takes place in similar way as in the alloys with 11 % by weight Mo. There are 1 figure, 1 table, and 1 Soviet reference.

SUBMITTED:

August 15, 1958

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SOV/78-4-10-24/40

5(2)
AUTHORS:

Ageyev, N. V., Rogachevskaya, Z. M.

TITLE:

Stabilization of the β -Phase in the Alloys of Titanium -Molybdenum - Iron

PERIODICAL:

Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 10, pp 2323 - 2328(USSR)

ABSTRACT:

In previous papers (Refs 3,4) the authors investigated the stabilization of the β -phase in the binary alloys Ti-Mo and Ti-Fe and now report on the behavior of the β -phase in the ternary alloy. Table 1 gives the analysis of the initial products (titanium produced by means of magnesium-thermit, electrolytically obtained iron and molybdenum). The alloys were molten in the arc in helium atmosphere. Figure 1 shows the composition of the alloys obtained. By means of investigation of the microstructure, X-ray analysis, measurement of hardness and microhardness isothermal cross sections for 700, 800, 900 and 1000° were constructed (Fig 2) which reveal the phase composition. Figure 3 shows the stabilization of the β -phase in the temperature range 700-1000°. The β -phase is stable up to a total content in Fe and Mo of 10-12% up to 100°, at increased Fe+Mo content up to 300° (Fig 5).

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Stabilization of the β -Phase in the Alloys of Titanium - SOV/78-4-10-24/40
Molybdenum - Iron

At different composition of the alloys the β -phase decomposes when heated under precipitation of the ω - or α -phase (Fig 6), in which case the lattice constant of the β -phase decreases (Fig 7). In alloys with approximately 16-18% the separation of a second phase was observed which is denoted as TiFe, but could not be confirmed by X-ray analysis, since it possesses the same lattice as the β -phase and occurs only in small, considerably dispersed quantity. By its presence the solidity of the Ti-Fe-Mo-alloys is, however, considerably increased (Table 2). There are 7 figures, 2 tables, and 4 references, 2 of which are Soviet.

SUBMITTED: June 21, 1958

Card 2/2

5(2,4)
AUTHORS: Kopetskiy, Ch. V., Shekhtman, V. Sh., SOV/20-125-1-22/67
Ageyev, N. V., Corresponding Member, AS USSR, Savitskiy, Ye. M.

TITLE: Formation of the σ Phases in the Rhenium-manganese and
Rhenium-iron Systems (Obrazovaniye σ -faz v sistemakh
reniy-marganets i reniy-zhelezo)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 1, pp 87-88
(USSR)

ABSTRACT: Among the numerous known binary and ternary systems of
transition metals σ phases are observed, i.e. compounds with
an isomorphous structure of the β -U type. According to modern
opinions the condition for the formation of the σ phase is as
follows: if one of the components belongs to group VII or VIII
of the periodic system the second component must be of group
V A or VI A. However, the ϵ phase of the iron-rhenium system
has also a crystal lattice of the σ phase (Refs 1, 2). Since
the latter system does not correspond to the above-mentioned
condition the σ phase cannot be explained within the
framework of the existing theories (Refs 3, 4). The alloy
produced by the authors showed a diffraction pattern confirming
the data from reference 1 (Table 1). Lattice temperatures were:

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Formation of the σ Phases in the Rhenium-manganese
and Rhenium-iron System

SOV/20-125-1-22/67

$a = 9.92 \text{ \AA}$, $c = 4.69 \text{ \AA}$ and $c/a = 0.52$. Microhardness =
1234 kg/mm². Publications contain no data on the following
production of the rhenium-manganese alloy. It may be seen from
roentgenographic results that the annealed (for 360 hours in
vacuum at 1000°) alloy is homogeneous and has a lattice of the
 σ phase. Parameter: $a = 9.14 \text{ \AA}$, $c = 4.75 \text{ \AA}$, $c/a = 0.52$
(Table 1). The σ phase forms from enamel (Fig 1). The
observation of σ phases in the systems mentioned in the title
leads to additional difficulties in the theoretical explanation
of the conditions of formation of these compounds of transition
metals. If these phases are regarded as a type of electron
compounds (Ref 3), it strikes that rhenium similar to manganese
shows an anomalous behavior as compared to metals of other
groups. There are 1 figure, 1 table, and 4 references, 1 of
which is Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR
(Institute of Metallurgy imeni A. A. Baykov of the Academy of
Sciences, USSR)

SUBMITTED: November 17, 1958
Card 2/2

18 (7), 24 (7)

AUTHORS:

Ageyev, N. V., Shekhtman, V. Sh.

SOV/48-23-5-26/31

TITLE:

X-ray Investigation of Alloys of Rhenium With Molybdenum
(Rentgenograficheskoye issledovaniye splavov reniya s
molibdenom)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23,
Nr 5, pp 650 - 651 (USSR)

ABSTRACT:

In the introduction to the present paper the authors deal with the position of rhenium in the periodic system of elements, with the properties of its alloying combinations with a number of other elements, and with the metallic phases of such alloys. To determine the phases and the formation of alloys the authors of the present paper applied the X-ray phase analysis, making use of the K_{α} -Cu and K_{α} -Cr emission. Results are illustrated by a diagram (Fig 1). It is shown that the system Mo-Re consists of four monophase ranges, i.e. two solid solutions with the bases Mo and Re, respectively, and two metallic compounds. The lattice parameters of the solid solutions are shown in a further diagram. The diagrams are discussed in general and also the Laue diagrams obtained in the course of investigation

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X-ray Investigation of Alloys of Rhenium With
Molybdenum

SOV/48-23-5-26/31

are dealt with briefly. To clarify the order of the α -phase of the system, the intensity of 13 primary lines was investigated numerically for the case of the disordered state, and results are given in table 1 for three different possible orders, one of which appears to be the most probable. Investigations are also carried out concerning the intermetallic compounds (χ -phase) exhibiting a cubic space lattice. In this connection, also metallographic methods are applied, and the electric resistance is determined. Results are compared with other alloys. There are 2 figures and 2 tables.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR
(Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

Card 2/2

KOPETSKIY, Ch.V.; SHEKHMAN, V.Sh.; AGEYEV, N.V.; SAVITSKIY, Ye.M.

Formation of σ -phases in the systems rhenium - manganese and
rhenium - iron. Dokl.AN SSSR 125 no.1:87-88 Nr-Ap '59.
(MIRA 12:4)

1. Chlen-korrespondent AN SSSR (for Ageyev). Institut metallurgii
imeni A.A.Baykova AN SSSR.
(Rhenium alloys)

5(2,4)

SOV/20-127-5-21/58

AUTHORS:

~~Ageyev, N. V.~~, Corresponding Member, AS USSR, Shekhtman, V. Sh.

TITLE:

Some Rules Governing the Formation of Compounds of Rhenium With Transition Metals

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 5, pp 1011 - 1013 (USSR)

ABSTRACT:

Rhenium tends to the formation of σ - and χ -phases in binary systems (Ref 1). These phases have related crystalline structures and are widespread in various binary and ternary systems of transition metals. The binary systems of rhenium are therefore suitable objects for investigating the nature of the latter. Proceeding from their properties it may be assumed that the tendency to the formation of χ -phases in the mentioned binary systems is widely determined by the atomic volume. The amount of the relative difference of the atomic radii may be computed for transition metals in the rhenium systems by using the data from table 2 according to formula:

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$$P = \frac{R_{Me} - R_{Re}}{R_{Re}} \cdot 100\%$$
 Figure 1 shows the dependence of P on

Some Rules Governing the Formation of Compounds of
Rhenium With Transition Metals

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the sub-group number of the element in D. I. Mendeleev's periodic system in a diagram. In this diagram those metals are given which according to the data from publications (Refs 8 - 14) enter into compounds with rhenium. From these diagrams it may be seen that the χ -phase is formed only with those metals of the sub-groups 1VA, VA, and V1A which have a positive P, i. e. a longer atomic radius than rhenium: Ti, Zr, Nb, Ta, Mo and W. Metals of the same groups with a smaller atomic radius than that of Re (i.e. V and Cr) do not form this phase. It would be incorrect to maintain that the existence and the stability of the χ -phases is determined merely by P. Also the effect of electronic concentration must be taken into account. In several systems the σ -phases exist together with the χ -phases. This makes possible the observation of a certain connection between these compounds. Due to this fact it may be pointed out that if P is near to 5%, i.e. to a value which characterizes the difference of the interatomic distances in the α -Mn-unit cell (Table 1) the tendency to the formation of σ -phases decreases, whereas the tendency to the formation of the χ -phases increases. In this connection

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the authors make the following remarks concerning the nature of the χ -phases: in the mentioned formation of the χ -phases in binary systems of rhenium with certain metals the double nature of the two mentioned phases becomes manifest. They are compounds the existence and stability of which is determined to the same degree by P and by the rule of the electron concentration. The agreement of the chemical composition of the χ -phases with a certain structural formula connected with the atomic radius of the components indicates the similarity with the Laves phases. At the same time the χ -phases have some characteristics similar to those of the σ -phases; their existence is however, widely connected with the electron concentration. Thus the χ -phases occupy an intermediate position between the Laves and the σ -phases. There are 1 figure, 2 tables, and 17 references, 11 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: April 20, 1959

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24.7900

66411

SOV/20-128-6-15/63

AUTHORS: Bykov, V. N., Golovkin, V. S., Ageyev, N. V., Corresponding Member, AS USSR, Levdik, V. A., Vinogradov, S. I.

TITLE: On the Magnetic Structure of Chromium

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 6, pp 1153-1156 (USSR)

ABSTRACT: Brief mention is first made of previous investigations made in this field. To obtain clearer concepts concerning diffraction, monocrystalline chromium samples were used in a purity degree of 99.9667%. Octahedric monocrystals (sizes of from 3 to 5 mm) were adjusted on a two-armed goniometer of type GD-1, and lack of blocks was controlled by X-ray structural analysis. The recording took place in the planes (100), (110), (111), (210), through an angle extending to 40°. Diffraction on chromium monocrystals offers a clear picture of the splitting of the magnetic reflection in the (100) plane. Position and analysis of intensity in the medium triplet peak showed that this peak is the second order of the nuclear reflection on (200). The two outer peaks are evidently the split magnetic reflection on (100). A picture taken at temperature -100°C reveals an important in-

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On the Magnetic Structure of Chromium

crease in intensity of the split reflection peaks on (100), while intensity of nuclear peaks and, correspondingly, those of their second orders with an odd sum of the indices are increased only by the Debye temperature factor (within the measuring accuracy). With temperature dropping with rising intensity, also the angular distance between the split peaks widens from 25' at 20°C to 30' at -100°C. In the upper and lower critical temperature, a steep rise and an abrupt drop of intensity take place respectively. As the curves of intensity variations take a different course, the existence of a temperature hysteresis of intensity is very probable. The temperature range in which a magnetic reflection exists may be considered the range of the existence of an antiferromagnetic state of chromium. The temperature of antiferromagnetic transformation (44 and -115°) found by the present investigation agree with the points of anomalous changes of chromium properties within the error limits due to the metal purity. Experimental results concerning the scattering of neutrons and dilatometric measurements are well reproducible in different samples of monocrystalline chromium. On the whole, the results obtained agree with concepts of the magnetic sublattice, and even supply substantial integrations leading

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beyond the prevailing interpretation. The magnetic lattice of chromium is no repetition of the crystal lattice, but is deformed to a tetragonal symmetry. Certain directions are correlated with a minimum of energy which becomes crystallographically noticeable as a deviation of the magnetic lattice parameters from the nuclear lattice, i.e. by a certain degree of tetragonality of the magnetic lattice. The even peaks of split reflection on (100) agree with nuclear reflection as to the width, and they have at all temperatures the same distance from the theoretical position. The author thanks V. A. Trapeznikov for having supplied the chromium monocrystals. There are 4 figures and 13 references, 4 of which are Soviet.

SUBMITTED: July 6, 1959

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~~5-2~~ 18.1200

66456

AUTHORS: Ageyev, N. V., Corresponding Member, AS USSR, SOV/20-129-3-24/70
Kopetskiy, Ch. V., Savitskiy, Ye. M.,
Shekhtman, V. Sh.

TITLE: On the Interaction of the Elements of the VIIA Subgroup With
Transition Metals

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 3, pp 559 - 562
(USSR)

ABSTRACT: Mn is known to be an anomalous metal with regard to combining
forces between the atoms, the crystalline structure, etc.
(Refs 1,2). Active interaction with the elements of the sub-
groups IVA, VA, and VIA is typical of rhenium. In connection
herewith, σ - and χ -phases are formed in binary systems
(Refs 3,4). Mn and Re are analogous with regard to the forma-
tion of oxides, acids, etc. It is, however, unknown whether
they are analogous with regard to interaction with metals.
Table 1 shows distinct differences of the physical properties
of Mn, Re, and Tc. Great similarity of Mn and Re as to the for-
mation of metallic phases can be seen in analyzing the interac-
tion of Mn and Re with transition metals. Figure 1 shows the de-
pendence of the value of the dimension factor (razmernyy faktor) P

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With Transition Metals

(with regard to Mn and Re) on the group number of the periodic system for all transition metals (Ref 6). Figure 1 shows the compounds formed with a corresponding transition metal in a binary system of Mn or Re. Mn and Re and the above elements of the subgroups IVA and VA form Laves phases with a structure of the type $MgZn_2$ and $MgNi_2$ ($ZrRe_2$, $ZrMn_2$, $TiMn_2$, $TaMn_2$, $NbMn_2$). All these compounds are formed from the liquid phase and are stable up to room temperature. It may be concluded therefrom that there exists great similarity between Mn and Re in the formation of alloys with transition metals. This is proved, above all, by the type of interaction with elements which are at right and at the left of group VII in the periodic system. Compounds are formed with the metals of the subgroups IVA, VA, and VIA. Solid solutions on the basis of more simple structures or compounds with a simple structure, however, are formed with metals of group VIII. In binary systems, Mn and Re form the same type of phases with the metals of the titanium-, vanadium-, and chromium group. Mn and Re show a great tendency towards formation of σ -phases. The structure corresponding to the low-temperature

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On the Interaction of the Elements of the VIIA Subgroup With Transition Metals SOV/20-129-3-24/70

phase of Mn is formed as an independent compound in systems on Re basis. Since there are no papers available on Tc alloys, the binary systems can not be completely classified on the basis of subgroup VIIA. It may be assumed that Tc reacts in alloys in a similar way as Re. The comparatively distinct classification of the binary systems of transition metals with Mn and Re as well as a restricted set of phases existing in these systems are obviously related to the key position of subgroup VIIA among transition metals. There are 1 figure, 1 table, and 7 references, 3 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR
(Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences, USSR)

SUBMITTED: August 12, 1959

Card 3/3

ALISOVA, S.P.; VUL'F, L.B.; MARKOVICH, K.P.; PETROVA, L.A.; ROGACHEVSKAYA,
Z.M.; AGEYEV, N.V., red.; MOSSKVININA, R.Ya., red.; MUKHA, S.Ya.,
tekh. red.

[State diagrams of metal systems published in 1957] Diagrammy
sostoiania metallicheskih sistem, opublikovannye v 1957 godu.
Pod red. N.V.Ageeva. Moskva. no.3. 1960. 270 p.

(MIRA 14:7)

(Alloys)

AGAYEV, N? V. AND SHEKHTMAN, V.SH.

"The Crystal Chemistry of the Compounds of Rhenium and Transition Metals."

report presented at the 117th Meeting of the Electrochemical Society, CHICAGO, ILL.
1-5 May 1960

The compounds in the systems Re-Mo, Re-Mn, Re-Fe, et al. have been studied. The single crystals of the ζ -phase Re-Mo are received, from which the crystal-class symmetry and the dimensions of unit cell have been determined by X-ray method. The experimental study of the structure of two compounds in the Re-Mn and Re-Fe Systems has been carried out. It is found that both these compounds have a structure isomorphous to well known δ -phases. The conditions of formation of ζ and λ -phases in binary systems of rhenium with transition metals are analyzed. It is shown that formation of λ -phases is determined mostly by the ratio of the atomic radii of rhenium and the second component. The experimental data concerning the ordering of the atoms in the cells δ -phases and λ -phases in many binary systems on the base of rheniums are received.

AGEYEV, N. V. and SHEKHTMAN, V. Sh.

The Crystal Chemistry of the Compounds of
Rhenium with Transition Metals

N. V. Ageev and V. Sh. Shehtman, Academy of Science, Moscow

The compounds in the systems Re-Mo, Re-Mn, Re-Fe, et al, have been studied. The single crystals of the δ -phase Re-Mo are received, from which the crystal-class symmetry and the dimensions of unit cell have been determined by x-ray method. The experimental study of the structure of two compounds in the Re-Mn and Re-Fe systems has been carried out. It is found that both these compounds have a structure isomorphous to well-known δ -phases. The conditions of formation of δ - and x-phases in binary systems of rhenium with transition metals are analyzed. It is shown that the formation of x-phases is determined mostly by the relation of the atomic radii of rhenium and the second component. The experimental data concerning the ordering of the atoms in the cells δ -phases and x-phases in many binary systems on the base of rhenium are received.

Report presented at the 117th Meeting of the Electrochemical Society, Chicago,
1-5 May 1960.

181285
AUTHORS: Ageyev, N. V., Petrova, L. A. 69054
S/078/60/005/03/019/048
B004/B002

TITLE: The Stability of the β -Phase in Alloys of Titanium With Vanadium

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 3, pp 615-618
(USSR)

ABSTRACT: It was the purpose of the present paper to construct the phase diagrams of titanium-vanadium alloys and to investigate the stability of the metastable β -phase within the temperature range of -196° - $+500^{\circ}$. The initial product used was Ti produced by the magnesium-thermit process or from titanium iodide, and pure vanadium. The content of impurities in the initial substances is given. The Ti-V alloys of Ti produced by the magnesium-thermit process, were melted by G. N. Tarasenko and I. A. Prostov, collaborators of the VIAM (Vsesoyuznyy nauchno-issledovatel'skiy institut aviatsionnykh materialov - All-Union Scientific Research Institute of Aviation Materials). Tables 1, 2 give analyses of the alloys. Alloys with Ti produced by the magnesium-thermit process were forged at 900° - 950° and glowd in vacuum. They were metallographically and radiographically analyzed (RKU-camera). Their hardness was determined by means of a Vickers apparatus with a ✓

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69054

The Stability of the β -Phase in Alloys
of Titanium With Vanadium

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10 kg load. On the basis of the analysis of the alloys chilled in water, the metastable phase diagram of the alloys was drawn within the range of 700° - 1000° (Fig 1a). The β -phase was fixed with 19.27 weight% of V in an alloy chilled from 850° to 20° . The alloy of 15.08 weight% of V chilled from 1000° , contained the $\beta + \omega$ -phase. The alloy of 3.72 weight% of V showed the structure of an over-saturated α -phase. $\alpha + \beta$ -phase was found in alloys chilled below 850° . Table 2 gives the phase diagram of alloys produced by means of titanium iodide which were rolled at 900° . For preventing oxidation during rolling, the alloys were welded into covers of stainless steel. The alloy with 15.56 weight% of V contains $\beta + \omega$ -phase. All alloys with a vanadium content of over 24.41 weight% showed the structure of the solid β solution (Fig 1b). The stability of the β -phase was examined within the range of -196 - $+500^{\circ}$ in alloys which were obtained from Ti produced by the magnesium-thermit process. Figure 2 shows that the solid β -solution of the alloy with 19.27 weight% of V at negative and room temperatures is stable and at 100° is conserved for 81 hours. Heating to 200° - 400° causes decomposition via the ω -intermediate phase which gradually

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The Stability of the β -Phase in Alloys
of Titanium With Vanadium

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is transformed into the α -phase. Heating to 500° causes direct decomposition in the α -phase. The decomposition of the β -phase takes place under larger lattice constant reductions than in titanium alloys with Mo, Fe and Ni (Refs 1, 3). The radiograph of figure 4 shows a displacement of the β -phase lines as compared to the ω -phase lines, which increases together with halting time and temperature of heating. Figure 5 shows the decomposition diagram of the solid β -solution of Ti-V alloys. The stability of the solid β -solution increases with an increasing V-content. The hardness test of the alloys showed the hardness maximum to be within the $\beta+\omega$ -range. There are 5 figures, 2 tables, and 7 references, 4 of which are Soviet.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR
(Institute of Metallurgy imeni A. A. Baykov of the Academy of
Sciences, USSR)

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