187540

2597 S/126/61/012/001/006/020
E193/E480

AUTHORS: Gel'd, P.V. and Gertman, Yu.M.

TITLE: Density of liquid alloys of silicon with cobalt and nickel

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.1, pp.47-50

TEXT: It was shown earlier by the present authors (Ref.1: FMM, 1960, 10, 793) that when a liquid ferrosilicide is formed by reacting liquid iron and silicon, a volume contraction ΔV amounting to 36% takes place. This effect could be attributed either to stronger interaction between dissimilar particles ($\varepsilon_{Si,Si} \ll \varepsilon_{Fe,Si} \ll \varepsilon_{Fe,Fe}$) and/or to an increase in the coordination number Z. The object of the present investigation was to obtain more accurate information on the effect of these two factors on the magnitude of ΔV, and to provide experimental data on the properties of liquid silicides. To this end the density of liquid Si-Co and Si-Ni alloys at 1500°C was measured in hydrogen by the hydrostatic weighing method. The Si-Co and Si-Ni alloys were chosen for this purpose because their formation is accompanied by the evolution of a large quantity of heat and because

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both nickel and cobalt are characterized (up to their melting points) by the highest coordination number (Z = 12); consequently, the effect of simultaneous variation of ε and Z should be easier to study in Si-bearing alloys containing these elements. The results are reproduced in a table whose first column reads as follows: Vol.% of the metal, Co or Ni; ($d_{Co,Si\ exp}$, g/cm^3) experimentally determined density of the Co-Si alloys; ($d_{Ni,Si,\ exp}$, g/cm^3) experimentally determined density of the Ni-Si alloys; ($d_{Me,Si\ add}$, g/cm^3) calculated density of the Ni-Si and Co-Si alloys. Since the density of both cobalt and nickel are about the same, the calculated density of the Co-Si and Ni-Si alloys are also the same. In discussing the results obtained, the authors made the following points. (1) The densities of liquid nickel and cobalt are considerably higher than those determined by P.Kozakevitch and G.Urbain, (J.Iron and Steel Inst., 1957, 186, 167). (2) As in the case of the Fe-Si alloy, the formation of the Ni-Si and Co-Si alloys is accompanied by contraction. The maximum $\Delta V \simeq 23\%$ in the Ni-Si system corresponds to the alloy of the Ni_2Si composition, $\Delta V_{max} = 30\%$ in the Co-Si system corresponding to the CoSi alloy. Thus it has been shown that $\Delta V_{Fe,Si} > \Delta V_{Co,Si} > \Delta V_{Ni,Si}$.

This relationship does not tally with the relative magnitude of the heats of solution of the respective systems, which have been found by the present authors (Ref.3: FMM, 1960, 10, 299) to be: $\Delta H_{Fe,Si}$ = - 11.0 kcal/g atom; $\Delta H_{Co,Si}$ =-15.0 kcal/g atom; $\Delta H_{Ni,Si}$ = - 16.0 kcal/g atom. These and other considerations indicate that the volumetric changes ΔV accompanying the formation of silicides studied are not an unequivocal function of ΔH, but depend also on the degree of interaction between the particles of the alloys, ε, which increases with increasing Fe and Ni contents, on the coordination number Z which under these conditions decreases, and on other factors. Consequently, the empirical laws proposed by O.Kubashevskiy and E.Evans (Ref.11: Thermo-Chemistry in Metallurgy, Metallurgizdat, 1954) for determining heats of formation of compounds (solutions) from data on volumetric changes accompanying the formation of these compounds (solutions) cannot but yield erroneous results. There are 1 table and 11 references: 7 Soviet and 4 non-Soviet. The three references to English language publications read as follows: Kozakevitch P., Urbain G. Iron and Steel Inst., 1957, 186, 167; Newkirk J.B., Geisler, A.H. Acta met., 1953, 1, 456; Kubaschewski O., Haymer G., Trans.

25914 S/126/61/012/001/006/020
E193/E480

Density of liquid alloys ...

Faraday Soc., 1960, 56, 473.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M.Kirova (Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: October 21, 1960

Table.

Объемный % Me	0	10	20	30	40	50	60	70	80	90	100
$d_{Co,Si,эксп}$, г/см³	2,50	3,40	4,30	5,20	6,00	6,70	7,00	7,30	7,55	7,80	8,05
$d_{Ni,Si,эксп}$, г/см³	2,50	3,40	4,35	5,15	5,85	6,50	7,05	7,35	7,70	7,85	8,04
$d_{Me,Si,адд}$, г/см³	2,50	3,05	3,61	4,16	4,72	5,28	5,83	6,39	6,94	7,50	8,05

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S/126/61/012/002/013/019
18 9200 26563 E021/E480

AUTHORS: Korshunov, V.A., Sidorenko, F.A., Gel'd, P.V. and Davydov, K.N.

TITLE: The phase constituents of the MnSi-Si system

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.12, No.2, pp.277-284

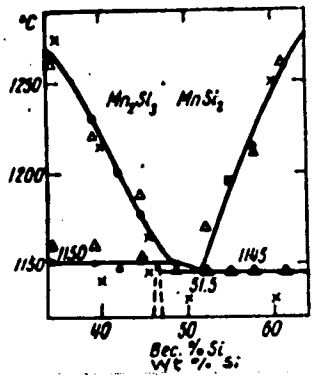
TEXT: The present work concentrated on establishing the character of silicides present in the MnSi-Si system. The samples were prepared from manganese (containing less than 0.05% impurities) and KM-1 silicon. Alloying was carried out in an evacuated and sealed quartz flask in a high frequency induction furnace. Alloys containing 44 to 55% Si were prepared. Metallographic, X-ray and thermal analysis was carried out. When viewed by polarized light under the microscope, the alloy containing 44% Si consisted of an optically active matrix of a higher silicide (Mn_nSi_{2n-x}) with optically inactive inclusions of monosilicide. With increasing Si content, the quantity of monosilicide decreased. The microhardness of the higher silicide was 1050 kg/mm^2 and that of the monosilicide 850 kg/mm^2. An alloy containing 46.5% Si was single-phased. Traces of a new

phase appeared at 47% Si. The new phase was optically inactive and similar to silicon in colour. An alloy with 49% Si had a coarse grained structure with a eutectic precipitate inside the grains. The alloy with 51.5% Si was practically all eutectic. Primary crystals of Si appear in samples with greater than 51.5% Si. The eutectic temperature was 1145°C. A peritectic transformation occurs at 1150°C and 48.8% Si. The MnSi-Si phase diagram was constructed from the results of thermal analysis and is shown in Fig.5 (crosses - results from present investigation, circles - from Ref.4 (Doerinckel F. Zs. anorg. allgem. chem., 1906, 50, 117) and triangles - from electrical conductivity measurements (Ref.2: Korshunov, V.A. Gel'd, P.V. Tr. Ural'skogo politekhnich. in-ta 1960, sb. No.105, p.142; Ref.3: Izv. vyzov, Fizika, 1960, No.6, 29; 1961, No.4, 146)). K.N.Davydov and P.V.Gel'd are mentioned in the article. There are 5 figures and 16 references: 11 Soviet and 5 non-Soviet. The two references to English language publications read as follows:
Hansen M., Anderko K. Constitution of Binary alloys, N. V., 1958;
Pearson W.B. A Handbook of Lattice Spacings and Structures of Metals and Alloys, London, 1958.
Card 2/3

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M.Kirova
(Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: November 24, 1960

Fig.5.



Card 3/3

30455

S/126/61/012/003/014/021
E111/E335

15 2240

AUTHORS: Davydov, K.N., Sidorenko, F.A. and Gel'd, P.V.

TITLE: The martensitic transformation in Mn_3Si

PERIODICAL: Fizika metallov i metallovedeniye, v. 12, no. 3, 1961, 424 - 430

TEXT: It would be of great interest to establish whether martensitic diffusionless processes of the type observed in wustite (Ref. 4 - R. Collongues - Acta Cryst., 1954, 7, 213) occur in other oxides, carbides, borides, nitrides and silicides. This would further substantiate the views of G.B. Kurdyumov (Ref. 5 - Problems of Metallurgy and Metal Physics, Sbornik 3, Metallurgizdat, Moscow, 1952) on the universality of martensitic transformations. Davydov and Gel'd (Ref. 7 - Tr. UPI, 1957, Sb. 67, p. 96) have previously shown that the lowest silicide of manganese undergoes a phase-transformation over a somewhat extended temperature range, giving considerable property changes. Quenching of specimens containing Mn_3Si changes their properties and heating for 3-5 min at or over 400 °C causes the density to rise to values higher than reported (Ref. 8 - R. Frilley,

Rev. Metall., 1911, 8, 468). The authors report additional metallographic and X-ray structural investigations of an alloy with about 14.5 wt.% Si, carried out to establish the nature and peculiarities of this transformation. The alloy was induction-melted from electrolytic manganese (over 99.9% Mn) and purified technical silicon (over 99.2% Si) and homogenized at 1 020 °C for 50 hours. Before testing, some specimens were annealed at 500 °C and others were water- or air-quenched from 800 °C. Polished sections were etched in a 4% solution of hydrofluoric acid in alcohol. The annealed alloy consisted of fairly coarse polyhedral Mn_3Si grains lined, probably, with Mn_5Si_3. The water-quenched specimen had a structure typical of martensite-transformation products; this was less pronounced in the air-quenched and absent in the slowly-cooled alloy. The martensitic phase thus formed recrystallizes easily. Vacuum-heating to 800 °C of a polished section of a previously annealed alloy gave a relief characteristic of martensitic phases. X-ray investigations, carried out in $CrK_{\alpha,\beta}$ radiation gave a lattice

The martensitic transformation ....

parameter value of a = 2.854 kX for Mn_5Si, which is in poor agreement with published values (Ref. 10 - W.B. Pearson - Handbook of Lattice Spacings and Structures of Metals and Alloys, Pergamon Press, N.Y., 1958; Ref. 11 - Ye.I. Gladyshevskiy, P.I. Kripyakevich and Yu.B. Kuz'ma - FMM, 1956, 2, 454). The Debye patterns of annealed and quenched alloy powders were identical. To elucidate the reproducibility of crystallographic orientations obtained under various conditions, special experiments were carried out. The specimen was mounted in a miniature furnace, in a type KPOC-1 (KPOS-1) camera, 62 mm from the film. The beam was passed through two 0.8-mm diameter diaphragms. Spots obtained at an angle of 78.6° were registered on a flat film. Significant differences as well as similarities were found in the patterns obtained from an annealed specimen and from the same spot of the specimen water-quenched from 750 °C. Additional spots on the pattern of the quenched specimen can be related to the needle-like structural component. This and other evidence indicates that the needle-phase occupies most of the volume in the quenched alloy and that the needles (or plates) are mutually

ordered. In another series, the patterns were obtained at a specimen-film distance of only 30 mm, at various temperatures from specimens subjected to various treatments; both factors influenced the pattern. Interpretation is made difficult by insufficient information on the phase diagram of the Mn-Si system and absence of high-temperature Debye patterns. The existence of a transformation, probably polymorphic, in Mn_3Si on heating at about 600 - 650 °C has, however, been confirmed. The transformation is martensitic on rapid and diffusional on slow cooling. The nature of the previously observed dilatometric and thermal effects near 400 °C remains obscure and further high-temperature X-ray work is needed. There are 5 figures and 14 references: 9 Soviet-bloc and 5 non-Soviet-bloc. The four latest English-language references mentioned are: Ref. 1 - E.O. Hall - Twinning and diffusionless transformations in metals, Butterworths Sci.Publ., L, 1954; Refs. 4 and 10 (quoted in text) and Ref. 12 - M. Hansen and K. Anderko - Constitution of Binary Alloys, McGraw-Hill Comp., N.Y., 1958.

30455

S/126/61/012/003/014/021

The martensitic transformation E111/E335

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M. Kirova (Ural Polytechnical Institute im. S.M. Kirov)

SUBMITTED: February 4, 1961

X

Card 5/5

30458

S/126/61/012/003/021/021
E073/E335

5.2610

AUTHORS: Shtol'ts, A.K. and Gel'd, P.V.

TITLE: On a new phase in the system iron-germanium

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.3, 1961, 462

TEXT: According to K. Ruttenwit and G. Masing (Ref.1 - Zs. Metallkunde, 1940, 32, 52), germanium forms with iron two congruently fusing intermetallic compounds, the composition of which can be approximately described by the formulae Fe_2Ge and $FeGe_2$, and an α-solid solution of a wide range of homogeneity. More careful study of the alloy (produced from reduced iron and fragments of germanium single crystals) containing 26.07, 28.31, 30.17 and 35.17 wt.% Ge revealed the presence in these of a new phase component. Metallographic study of the first two specimens has shown that, in addition to crystals of this compound, these contain rejections of a solid solution of germanium in iron. The quantity of these is large in an alloy containing 26.07% Ge but small (2-3 wt.%) in specimens containing 28.31% Ge. Specimens with 30.17 and 35.17% Ge also contained two phases. As was to be anticipated, in these, crystals of the solid solution based on the

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intermetallide Fe_2Ge were found to be in equilibrium with the new germanide. The quantity of the latter in an alloy with 30.17% Ge was about 5 wt.% and increased with increasing Ge content. This allows the conclusion that the detected compound of Ge with Fe has a relatively narrow range of homogeneity (1 - 1.5 wt.%) and this composition can be satisfactorily described by the formula $Fe_{3.25}Ge(Fe_{13}Ge_4)$. On observation in polarised light between crossed Nicol prisms, the colour of the grains of this germanide changed with orientation from light grey to bluish grey. They manifest clearly optical activity and reproducibility of the coloration is detected on turning the microscope table by 180°. As regards the mechanical properties, $Fe_{3.25}Ge$ differs considerably from the brittle germanides Fe_2Ge and $FeGe_2$. This compound has a relatively high toughness and hardness and therefore it is difficult to crush. The microhardness of $Fe_{3.25}Ge$ crystals determined by means of the ПМТ-3 (PMT-3) instrument (using common salt single crystals as a standard) was about 530 kg/mm^2. The specific magnetization of this phase was very different and this was probably due to its ferromagnetic nature. X-ray structural studies

were made on specimens which were homogenised for 100 hours in a vacuum furnace at 1000°C and then crushed and again annealed at 1000°C for 3 hours to relieve the stresses. The results obtained confirm the metallographic investigations and showed that $Fe_{3.25}Ge$ has a hexagonal structure which apparently is similar to that of Fe_3Sn and $Mn_{3.25}Ge$ (Ref.2 - U. Zwicker, E. Jahn and K. Schubert - Z. Metallkunde, 1949, 40, 433; Ref.3 - O. Nial - Sversk. Kemi Tidskr., 1947, 59, 165). The lattice parameters $Fe_{3.25}Ge$ change slightly with changing composition. Thus, for specimens containing the new, iron-saturated, germanide these are: a = (5.1612 $\pm$ 0.0005) kX, c = (4.2111 $\pm$ 0.0005) kX; for specimens in the state of equilibrium with Fe_2Ge the phase has the following lattice parameters: a = (5.1680 $\pm$ 0.0005) kX; c = (4.2175 $\pm$ 0.0005) kX (practically equal ratios of c/a = 0.8160). These characteristics differ only little from those established, for instance for $Mn_{3.25}Ge$ ($a = 5.33_6$; $c = 4.36_5$; c/a = 0.8165). Thus, the here described investigations indicate the presence in the Fe-Ge system of $Fe_{3.25}Ge$ with a relatively narrow range of homogeneity and a structure similar to that of Fe_3Sn and $Mn_{3.25}Ge$ (type DO_{19} structure).

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On a new phase in the system ... S/126/61/012/003/021/021
E073/E335

in addition to the earlier described intermetallides Fe_2Ge and $FeGe_2$. There are 3 non-Soviet-bloc references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S.M.Kirova
(Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: April 28, 1961

Card 4/4

SABIRZYANOV, A.V.; SHUMILOV, M.A.; GEL'D, P.V.; OZHGIKHINA, G.V.

Solubility of aluminum in fleboite. Fiz. met. i metalloved. 12 no.5:714-721 N '61. (MIRA 14:12)

1. Ural'skiy politekhnicheskiy institut imeni S.M.Kirova.
(Iron-silicon-aluminum alloys—Metallography)

32670

18 8100

S/196/62/000/001/006/013
E194/E155

AUTHORS: Gulevskaya, A.S., Lipatova, V.A., and Gel'd, P.V.

TITLE: The thermal conductivity of alloys of Fe, Si, containing β-lebeauite

PERIODICAL: Referativnyy zhurnal, Elektrotekhnika i energetika, no.1, 1962, 6, abstract 1B 37. (Tr. Ural'skogo politekhn. in-ta, 114, 1961, 90-95)

TEXT: The article describes the equipment, procedure and results of an investigation of the specific thermal conductivity (at 20 °C) of alloys of Fe and Si containing 40-100% Si. Tests were made on alloys of industrial purity and on those of higher purity; in the case of alloys containing up to 80% Si the specific thermal conductivity of both purity grades is the same despite their very different specific electrical conductivities. If the Si content is further increased the thermal properties of the two grades diverge greatly. This is attributed to increased sensitivity of the thermal conductivity of Si to the degree of purity. It was also found that the addition of up to 0.1% Al

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The thermal conductivity of alloys...

noticeably reduces the thermal conductivity of alloys. Further increase in the Al content causes almost no change in the specific thermal conductivity; an analogous relationship between the change in specific conductivity and thermal e.m.f. confirms the assumption of low solubility of Al in β-lebeauite.
11 literature references.

[Abstractor's note: Complete translation.]

Card 2/2

S/137/61/000/012/134/149
A006/A101

AUTHORS: Gertman, Yu.M., Gel'd, P.V.

TITLE: A unit to determine integral and partial mixing heat of melts up to 1,500°C

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 12, 1961, 39, abstract 121305 ("Tr. Ural'skogo politekhn. in-ta", 1961, no. 114, 96-106)

TEXT: The authors describe a high-temperature calorimeter with an isothermal casing used to determine the mixing temperature of metals (V, Cr, Mn, Co, Ni, Nb, Ca, with Al and Si). A silite furnace was employed as a heater; it is power-supplied from a CH-2 (SN-2) lamp generator. A corundise (zircon) crucible was employed as calorimeter; it was placed on the point of a trihedral prism and equipped with a hermetic cover and a quartz tube to supply purified argon to the metal surface. The mixing of reagents in the calorimeter was performed with the aid of a mixer and also by thermo-diffusion. Amounts of 150 - 200 g metal were charged into the crucible and 6 batches of Si (about 10 g) and 1 batch of metal (about 15 g) into the distributing chaser. After checking the hermetic sealing and blowing argon through the system, the crucible was placed into the preheated

Card 1/2

S/137/61/000/012/134/149
A006/A101

A unit to determine integral and partial mixing ...

furnace (its temperature was controlled by a thermoregulator) and the temperature field in the unit was stabilized. After isothermal holding for 1 hour, a solid metal batch was thrown into the liquid metal, causing a temperature change of the crucible. The temperature process of the pool was checked with an extensible W-Mo thermocouple. After equalizing the temperature, the first Si batch was thrown-off and the temperature of the system was observed, etc. Calculations of the mixing heat are given. It is stated that the error in determining the mixing heat was 3 - 8%. There are 12 references.

A. Nikonov

[Abstracter's note: Complete translation]

Card 2/2

15 2240

32615
S/137/61/000/011/071/123
AC60/A101

AUTHORS: Alyamovskiy, S.I., Gel'd, P.V., Matveyevko, I.I.

TITLE: On the phase components of the Nb-Si system

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 11, 1961, 24, abstract 11Zh146 ("Tr. Ural'skogo politekhn. in-ta", 1961, coll. 114, 149-151)

TEXT: Alloys of silicides of niobium were prepared by sintering briquetted mixtures of powdered Nb (99.6%) and Si (99.98%) in a vacuum furnace at 1,200-1,600°C and were studied by the methods of microscopic and X-ray structure analyses. The phases of the silicides have marked regions of homogeneity: for α = = Nb_5Si_3 - from $NbSi_{0.58}$ to $NbSi_{0.56}$; for $NbSi_2$ - from $NbSi_{1.85}$ to $NbSi_{2.2}$. Here the lattice parameters α of Nb_5Si_3 and $NbSi_2$ remain practically constant. In the Nb-Si system there exist solid substitution solutions both for $NbSi_2$ and α = Nb_5Si_3. At 1,000-1,100°C, while annealing alloys containing Nb_4Si, there occurs a decomposition $Nb_4Si \longrightarrow Nb + Nb_5Si_3$. There are 8 references.

Z. Rogashevskaya

[Abstracter's note: Complete translation]

Card 1/1

S/137/62/000/001/120/237
A052/A101

AUTHORS: Dubrovskaya, L. B., Gel'd, P. V.

TITLE: Quasibinary system α-leboite-chromium bisilicide

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 5, abstract 1I30 ("Tr. Ural'skogo politekhn. in-ta", no. 114, 1961, 151-153)

TEXT: The pseudobinary system α-leboite (~55% Si and 45% Fe) - $CrSi_2$ was studied. Alloys were melted out of both pure and commercial materials, annealed and hardened at 1080°C and investigated by the methods of metallographic and X-ray analysis. In the system α-leboite-$CrSi_2$ intersaturated solutions of Fe and Cr bisilicides are formed. A low mutual solubility of components and the formation of eutectic by them at 1,150°C and ~15% $CrSi_2$ are observed. $CrSi_2$ raises slightly the a-parameter (from 2.6842 to 2.6884 kX) of α-leboite, and the c-parameter remains constant (5.123 kX); α-leboite does not change practically a-parameter (4.4134 kX) of $CrSi_2$ and reduces slightly the c-parameter(from 6.351 to 6.349 kX). There are 8 references.

Z. Rogachevskaya

[Abstracter's note: Complete translation]

Card 1/1

S/194/62/000/002/041/096
D201/D301

24.7600

AUTHORS: Korshunov, V. A. and Gel'd, P. V.

TITLE: Electrical conductivity and thermal e.m.f. of manganese silicides

PERIODICAL: Referativnyy zhurnal, Avtomatika i radioelektronika, no. 2, 1962, abstract 2-4-3shch (Tr. Ural'skogo politekhn. in-ta, 1961, v. 114, 164-165)

TEXT: The electrical conductivity σ and thermal e.m.f. α of manganese silicides were investigated. Comparison of values of σ and α (1500 - 10,000 $ohm^{-1}cm^{-1}$ and from + 15 to +20 μV/degree for Mn_3Si, Mn_5Si_3 and MnSi respectively) of lower silicides and those of a higher silicide $MnSi_{1.67}$ - $MnSi_{1.73}$ (200 - 500 $ohm^{-1}cm^{-1}$ and from +70 to +110 μV/degree) to show the metallic nature of the former and semi-metallic nature of the latter. The current carrier concentration in the silicon saturated higher silicide is of special in-

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terest since it can be used as part of a thermocouple, for which this concentration is near optimum at 20°C and in the temperature range 300 - 1000°K results in an efficiency of about 6%. The efficiency of this silicide might be increased by alloying. A note is made of the fact that the results of measuring σ and α of pure manganese silicides show that impurities present in technically pure components (Fe, Al, Ca) do not qualitatively change the electrical properties of Si-Mn alloys. 4 references. [Abstracter's note: Complete translation.]

GEL'D, P.V., prof., doktor tekhn. nauk; KORSHUNOV, V.A., assistent; GERTMAN, Yu.M., inzhener-issledovatel'; PETRUSHEVSKIY, M.S., assistent

Structure of iron and manganese silicide melts. Sbor. nauch. trud. Ural. politekh. inst. no.122:40-48 '61. (MIRA 17:12)

S/200/62/000/005/003/005
I003/I242

AUTHORS: Gel'd, P.V., Matveyenko, I.I., and Alyamovskiy, S.I.

TITLE: Intermediate products in the process of reduction of vanadium oxides by carbon

PERIODICAL: Akademiya nauk SSSR. Sibirskoye otdeleniye. Izvestiya, no.5, 1962, 59-69

TEXT: The kinetics of the reduction of vanadium oxides by carbon have received little attention. Highly pure vanadium has good mechanical and corrosion resistance properties and there are good prospects for the industrial application of vanadium carbides and oxycarbides. The kinetics of the reduction of V_2O_3 was investigated between 1100 and 1600°C. The reduction is not

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S/200/62/000/005/003/005
I003/I242

Intermediate products in the process of...

a single reaction because, while its initial stage depends on the rate of gasification of carbon, on the absorption or chemical processes and on crystallographic changes taking place in the reduced oxides, the final stage depends on the velocity of diffusion of atoms of O,C, and V through the lattices of oxides and particularly oxycarbides. The first product consists of an intermediate oxycarbide δ - phase which can be transformed either into an ξ - phase or into an intermediate γ-phase, depending on the composition of the charge, on the nature of the reducing agent, and on the temperature. The reduction of higher oxides V_2O_5 and VO_2 by carbon below 800°C leads to the formation of the V_6O_{13}-, VO_2-, V_3O_5-, and V_2O_3- phases. No intermediate $VO_{1.87}$, $VO_{1.86}$, $VO_{1.84}$, $VO_{1.80}$ and $VO_{1.75}$ phases have been found. There is 1 figure and 4 tables.

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S/200/62/000/005/003/005
I003/I242

Intermediate products in the process of...

ASSOCIATION: Ural'skii filial AN SSSR, Sverdlovsk (The Ural branch of the AS USSR, Sverdlovsk)

SUBMITTED: June 24, 1961

3/3

S/148/62/000/011/001/013
E071/E151

AUTHORS: Krentsis, R.P., and Gel'd, P.V.

TITLE: On the thermochemistry of iron silicides, heat capacity, enthalpy and entropy of Fe_3Si

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, no.11, 1962, 12-19

TEXT: In view of the absence of reliable data on the effect of temperature on the heat capacity, enthalpy and entropy of iron silicides, and also that of their phase transformations, the authors carried out some new determinations of ΔH, c_p and S of pure iron silicides. In this paper thermochemical constants of Fe_3Si are reported for completely ordered (checked by optical and X-ray methods) materials. Low temperature (55-300 °K) determinations of heat capacity were made in an adiabatic calorimeter, using solid and liquid nitrogen and ice as cooling agents. Enthalpy (0 - 1500 °C) was investigated in mixing adiabatic calorimeters. The experimental procedure is described in some detail. In all cases experimental errors were about 1%. The temperature-enthalpy curve is characterised by three distinct

Card 1/2

SIDORENKO, F.A., GELD, P.V.

Accuracy of the rapid determination of silicon in ferrosilicon from its density. Zav.lab. 28 no.6:709-710 '62. (MIRA 15:5)

1. Ural'skiy politekhnicheskiy institut imeni S.M. Kirova.
(Silicon--Analysis) (Iron-silicon alloys)

PETRUSHEVSKIY, M.S.; GEL'D, P.V.

Solubility of carbon in liquid ferrosilicochromium. Zhur.prikl.-khim. 35 no.6:1227-1236 Je '62. (MIRA 15:7)
(Iron-silicon-chromium alloys) (Carbon)

S/080/62/035/007/005/013
D267/D307

AUTHORS: Gel'd, P.V. and Lyubimov, V.D.

TITLE: Kinetic peculiarities of the process of reducing niobium pentoxide with hydrogen

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 7, 1962, 1571-1579

TEXT: To fill the existing gap, the first stage of reduction ($Nb_2O_5 \longrightarrow NbO_2$) with H_2 has been studied from the point of view of kinetics. The very pure Nb_2O_5 used (0.05% Ti, 0.005% each of Si, Al, Fe and ... and less than 0.1% Ta) had a specific surface of 0.1 m^2/g and consisted mainly of the high-temperature H modification. The method of continuous weighing was used. The process was studied at temperatures 760-1060°C and pressures 20 - 740 mm Hg. The kinetic characteristics point to the autocatalytic nature of the reduction process. The apparent energy of activation of the process is ca. 24 kcal/g-atom. The rate of reaction varies as the 0.6th power of hydrogen pressure. The presence of extremely small

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S/080/62/035/007/005/013
D267/D307

Kinet. ... peculiarities ...

traces of water vapor inhibits the process of reduction. The electrical conductivity of Nb_2O_5 and of the products of its reduction increases exponentially with temperature. The process was not inhibited by the gas exchange, nor was it limited by the mobility of ions in the lattices of oxides. The limiting stage is found in the reactions which take place at the boundary between the condensed and gaseous reagents. There are 7 figures.

SUBMITTED: June 22, 1961

Card 2/2

5.4800

3020
S/076/62/036/007/005/010
B101/B138

AUTHORS: Gertman, Yu. M., and Gel'd, P. V. (Sverdlovsk)

TITLE: Thermochemistry of molten iron-silicon alloys

PERIODICAL: Zhurnal fizicheskoy khimii, v. 36, no. 7, 1962, 1477 - 1482

TEXT: To obtain more accurate data on the thermochemistry of molten Fe-Si alloys, their heats of formation were measured at 1525°C, and the density isotherms of the systems were plotted. Apparatus and methods had been described earlier (Izv. vysshikh uchebn. zaved. (Chernaya metallurgiya), no. 1, 83, 1958). Results: (1) Up to 25% concentration of the second component the heats of mixing agree well with published figures: ΔH^{o}_{Fe} = -24.7 kcal/g-atom, ΔH^{o}_{Si} = -30.0 kcal/g-atom, but are very different from the data found by J. Chipman et al. (Acta metallurg., 2, 439, 1954) for a high content of the second component: at ~46 atom% Si, ΔH was -11 kcal/g-atom. Salient points on the isotherms around the FeSi and $FeSi_{2.4}$ (leboite) compositions, and compression of the melt, indicate non-

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equivalence, particle interaction and a complex short-range order. At equiatomic composition, FeSi quasimolecules are formed, the density rises to about 5.65 g/cm^3, the volume decreases by about 36%. The system thus fails to obey the law for regular solutions. Fe-Si melts have a microinhomogeneous structure with short-range order in the arrangement of the constituent atoms. This also explains the other physical (structural, electrical, magnetic, surface, thermal, etc.) irregularities of these alloys. In contradiction of, B. M. Turovskiy, A. P. Lyubimov (Izv. vysshikh uchebn. zaved. (Chernaya metallurgiya), no. 1, 24, 1960), no β-phase (Fe_2Si_5) or Fe_3Si could be found. There are 4 figures and 1 table. The most important English-language reference is: F. Glaser, W. Iwanick, J. Metals, 8, 1290, 1956 .

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S. M. Kirova (Ural Polytechnic Institute imeni S. M. Kirov)

SUBMITTED: October 1, 1960

S/080/62/035/009/003/014
D204/D307

AUTHORS: Gel'd, P.V., and Lyubimov, V.D.

TITLE: The rate of reduction of Nb_2O_5 with carbon monoxide

PERIODICAL: Zhurnal prikladnoy khimii, v. 35, no. 9, 1962, 1940 - 1945

TEXT: The reduction of Nb_2O_5 with CO was studied at CO pressures (p_{CO}) of 20-300 mm Hg, at 800 - 1015°C, over periods of up to 4 hours. The starting oxide contained 0.05 % Ti, 0.005 % of each of Si, Al, Fe and <0.1 % Ta, and was preheated at 1100°C in vacuum before the experiments. It was assumed that under the above conditions the reduction proceeded only to Nb_2O_4; this was later confirmed by X-ray analysis of the products. The degree of reduction (n) of cold-pressed oxide crushed into 1 - 2 mm granules was largely independent of the rate at which CO was passed over them, but was considerably increased by raising the temperature; thus n was respectively $\sim$10 and $\sim$90 % at 800 and 1050°C, after 2 hours. The n/time

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The rate of reduction of ...

plots were linear up to 950°C. Small (2 %) additions of Na and K carbonates to the Nb_2O_5 slightly accelerated the process; K_2CO_3 was most effective. An increase in the specific surface area (s) of the Nb_2O_5 particles (1.24, 8.10 and 10.53 m^2/g) promoted faster reaction but no linear relations were found between the rate of reaction and s, owing to the rapid recrystallization of the oxide and consequent, quick reduction of the surface area of the particles. The rate was also found to increase in proportion to $\sqrt{p_{CO}}$. The activation energy $\cong$ 25 kcal. It is concluded that the overall rate is governed by adsorptive and crystallochemical processes. There are 5 figures and 1 table.

SUBMITTED: August 7, 1961

Card 2/2

S/263/62/000/012/004/005
I007/1207

AUTHOR: Serebrennikov, N. N., Krentsis, R. P. and Gel'd, P. V.

TITLE: Device for determining heat content (enthalpy) of solid and liquid alloys or steels

PERIODICAL: Referativnyy zhurnal, otdel'nyy vypusk. 32. Izmeritel'naya tekhnika, no. 12, 1962, 44, abstract 32.12.424 In collection "Fiz.-khim. osnovy proviz-va stali" M., AN SSSR, 1961. 287–292

TEXT: A vacuum-type adiabatic calorimeter is described for determining the thermophysical parameters of various metals and alloys. The device comprises a calorimeter, furnace for heating test specimens, and electric measuring instruments. The device, working on the mixing principle, permits measurements up to 1500–1700°C, the study of the temperature dependence of enthalpy and specific heat of steel in the range from ambient to melting temperatures, and determination of the heat of melting (fusion). The method of calibration and checking of the device is outlined. Results are reported on investigations of the temperature dependence of enthalpy for ЭИ572 (EI572) and 18ХНВА (18 KhNVA) steel grades. The course of the temperature dependence was found to be different for the steel grades investigated. Large inclusions of carbon and alloying elements markedly decrease the initial melting point (1375°C for EI572 steel and 1485°C for 18KhNVA and widen the range of the melting temperature (by 125°C and 40°C for the EI572 and 18KhNVA steel grades respectively). The melting heat was found to be 57 cal/g and 60 cal/g for the investigated steel grades. There are 4 figures and 7 references.

[Abstracter's note: Complete translation.]

Card 1/1

ALYAMOVSKIY, S.I.; GEL'D, P.V.; MATVEYENKO, I.I.

Concentration regions of stability of niobium silicides at 1250°.
Zhur.neorg.khim. 7 no.4:836-843 Ap '62. (MIRA 15:4)
(Niobium-silicon alloys)

SHTOL'TS, A.K.; GEL'D, P.V.

Solid solutions of germanium in α-iron. Fiz.met.i metalloved. 13 no.1:159-160 Ja '62. (MIRA 15:3)

1. Ural'skiy politekhnicheskiy institut imeni S.M.Kirova.
(Iron alloys) (Germanium)

S/126/62/013/006/005/018
E111/E352

AUTHORS: Gol'tsov, V.A., Gel'd, P.V. and Kotik, E.M.

TITLE: Influence of phase work-hardening of austenite on its permeability to hydrogen

PERIODICAL: Fizika metallov i metallovedeniye, v. 13, no.6, 1962, 860 - 868

TEXT: Cyclic $\gamma \rightarrow \alpha \rightarrow \gamma$ heat-treatment stabilizes and hardens austenite and has an anomalous effect on the coefficient of self-diffusion of iron. The present investigation was undertaken because it was not clear how such treatment affected the permeability of steels to hydrogen. Permeability was studied on Fe-Ni (12.6 and 25% Ni) alloys at 280 - 1 020 °C. It was found that the permeability of α-phase with a martensitic structure changes exponentially with temperature up to the A_s point, the activation energy being 17-19 kcal/mole. Equilibrium austenite has activation energies for the hydrogen-penetration process of 28-31 kcal/mole; the value depends little on composition. The reverse martensite process, leading to the formation of hardened austenite, greatly complicates the hydrogen-

Card 1/2

Influence of ....

migration stage and causes the activation energy to increase. The degree of phase work-hardening of austenite and the activation energy for hydrogen penetration are clearly related, apparently because fracture of mosaic blocks and growth of internal stresses complicates the hydrogen diffusion stage in austenite. It is thus possible that the development of intragranular boundaries leads to an increase in defect concentrations which act as hydrogen "traps" with a higher energy barrier as regards movement along them. The first $\gamma \rightarrow \alpha \rightarrow \gamma$ transformation cycle has an especially great effect on permeability to hydrogen; later, the effect is usually negligible. Activation energy changes appreciably if not less than 50% $\gamma \rightarrow \alpha$ transformation is achieved in the direct martensite transformation; at 75% the effects are especially great. There are 4 figures and 1 table.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M. Kirova (Ural Polytechnical Institute im. S.M. Kirov)

SUBMITTED: November 16, 1961

Card 2/2

PETRUSHEVSKIY, M.S.; GEL'D, P.V.

Solubility of carbon in liquid ferrochrome and silicon chromium. Zhur.prikl.khim. 35 no.2:233-242 F :62. (MIRA 15:2)
(Chromium alloys) (Carbon)

SHCHIPANOVA, L.V.; GEL'D, P.V.

Enthalpy of solid and liquid germanium. Izv. vys. ucheb. zav.; tsvet. met. 5 no.6:111-112 '62. (MIRA 16:6)

1. Ural'skiy politekhnicheskiy institut, kafedra fiziki.
(Germanium—Thermal properties)

KRENTSIS, R.P.; GEL'D, P.V.

Thermochemistry, heat capacity, enthalpy and entropy of iron silicides. Izv.vys.ucheb.zav.; chern.met. 5 no.11:12-19 '62. (MIRA 15:12)

1. Ural'skiy politekhnicheskiy institut.
(Iron silicides—Thermal properties)

SKRIPOVA, Ye.A.; GEL'D, P.V.

Studying the distribution of aluminum in ferrosilicon by the method of local spectrum analysis. Izv.vys.ucheb.zav.; chern.met. 5 no.11:196-201 '62. (MIR 15:12)

1. Ural'skiy politekhnicheskiy institut.
(Ferrosilicon--Spectra) (Aluminum--Spectra)

GEL'D, P.V.; LIPATOVA, V.A.; SIDORENKO, F.A.; SHUBINA, T.S.

Antiferromagnetism of α-leboit. Fiz. met. i metalloved. 14 no.2: 298-299 Ag '62. (MIRA 15:10)

1. Ural'skiy politekhnicheskiy institut imeni Kirova.
(Ferromagnetism) (Iron-silicon alloys—Metallography)

POPOV, Aleksandr Artem'yevich; GEL'D, P.V., red.; SHTEYNBERG, M.M., red.; SYRCHINA, M.M., red. izd-va; MAL'KOVA, N.T., tekhn. red.

[Theoretical basis of the chemical and heat treatment of steel] Teoreticheskie osnovy khimiko-termicheskoi obrabotki stali. Sverdlovsk, Metallurgizdat, 1962. 118 p. (MIRA 15:10)
(Steel--heat treatment) (Diffusion coatings)

YESIN, Oleg Alekseyevich; GEL'D, Pavel Vladimirovich; MIKULINSKIY, A.S., prof., doktor, retsenzent; BUR'KOV, M.M., red. izd-va; MATLYUK, R.M., tekhn. red.

[Physical chemistry of pyrometallurgical processes]Fizicheskaia khimiia pirometallurgicheskikh protsessov. Sverdlovsk, Metallurgizdat. Pt.1.[Reactions between gaseous and solid phases] Reaktsii mezhdu gazoobraznymi i tverdymi fazami. 2., ispr. i dop. izd. 1962. 671 p. (MIRA 15:10)
(Metals at high temperature)
(Chemistry, Physical and theoretical)

S/149/62/000/006/004/008
A006/A101

AUTHORS: Shchipanova, L. V., Gel'd, P. V.

TITLE: Enthalpy of solid and liquid germanium

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 6, 1962, 111 - 112

TEXT: The authors carried out high-temperature investigations of three single-crystal germanium specimens at 0 - 1,250°C, for the purpose of determining the thermal properties of germanium. The results obtained show that the melting point of the specimens was near 938 - 939°C, which is in agreement with results obtained by Hassion, Thurmond and Trumbore (melting point at 937.2°C). The enthalpy jump in the melting point is about 123 cal/g or 8.93 kcal/g-atom; these values exceed those obtained by Witting, Greiner, Ouellis and de Rocha. Below the melting point, germanium enthalpy can be described satisfactorily by Kelley's equation, from which it follows that $C_{p\ sol.}$ is $5.98 + 0.82 \cdot 10^{-3}T - 0.56 \cdot 10^{5}T^{-2}$. Over the melting point the experimental data are in a better agreement with

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S/849/62/000/000/013/016
A006/A101

AUTHORS: Sidorenko, F. A., Gel'd, P. V., Dubrovskaya, L. B.

TITLE: Roentgenostructural analysis of leboite

SOURCE: Vysokotemperaturnyye metallokeramicheskiye materialy, Inst. metallokerm. i spets. spl. AN Ukr. SSR, Kiev, Izd-vo AN Ukr. SSR, 1962, 124 - 132

TEXT: It was experimentally established that leboite is able to show diametrally opposite properties depending on its structural state, i.e. metallic properties in high-temperature modification and semiconductor properties in low-temperature modification. The authors present additional data on structural peculiarities of α-and β-leboite, which explain to a certain degree the causes of their different electric properties. Results are given of metallographic and roentgenographic determinations of the concentration limits of α-leboite stability; of the picnometrical determination of the alloy density and the type of silicon solid solutions in disilicide. Moreover, the authors determined expansion coefficients of α-leboite along the crystal lattice axes by comparing experimental and calculated intensities. The structural parameter z was made more

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S/849/62/000/000/013/016
A006/A101

Roentgenostructural analysis of leboite

precise by plotting $[F]^2$-series and series of electronic density. At 1080°C α-leboite was found to be stable in a concentration range from 53.5 to 56.5% Si. α-leboite represents a phase of variable composition (on disilicide base) with vacancies in the iron sublattice. The concentration of vacancies changes within 12 to 23%. The values of expansion coefficients along the lattice axes correspond to the given model. The structural parameter z of the α-leboite lattice is equal to 0.275 and describes its structure better than value z = 0.25, previously used. A schematic model of β-leboite structure is proposed. (Figure 3) The bright circles represent the centers of silicon atoms; centers of iron atoms are designated by dark circles; the bright-and-dark circles represent the locations whose halves are statistically occupied by iron atoms. The model proposed yields, to the first approximation, satisfactory values of calculated intensities including the mean angles. Dislocations of atoms leading to normal interatomic distances, improve the agreement of calculated and measured intensities. It is assumed that the semiconductor properties of β-leboite may be explained by the primary coordination sphere of silicon atoms which is very similar to that of pure silicon and germanium. There are 3 figures and 2 tables.

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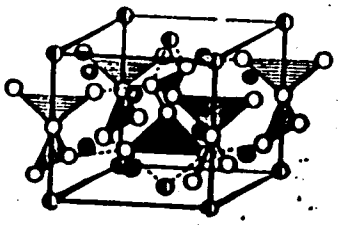
Roentgenostructural analysis of leboite

S/849/62/000/000/013/016
A006/A101

Figure 3. The model of β-leboite structure.



Card 3/3

S/849/62/000/000/015/016
A006/A101

AUTHORS: Gol'dberg, A. I., Lipatova, V. A., Gel'd, P. V.

TITLE: Electric properties of iron alloys with silicon containing leboite

SOURCE: Vysokotemperaturnyye metallokeramicheskiye materialy. Inst. metallo-ker. i spets. spl. AN Ukr.SSR, Kiev, Izd-vo AN Ukr.SSR, 1962, 140 - 147

TEXT: The authors present results of investigating the electric properties of iron alloys with silicon produced from commercial and pure initial materials, such as transformer iron and electrolytical iron with single-crystal silicon. Basic measurements were made with alloys containing 40 to 90 weight % Si. Electric conductivity ($\sigma = 1/\rho$), the Hall coeffcient (R_x) and the thermo-emf (α) of the aforementioned alloys were investigated. High-temperature α-leboite, existing in the Fe-Si system, was found to have metal conductivity. ρ, α, and R_x values are low and $d\rho/dT > 0$. Low-temperature β-leboite, sinthesized from both commercial and pure initial materials, shows high ρ, α and R_x, and a negative temperature coefficient of specific resistivity, indicating its semi-

Card 1/2

conductor nature. In the temperature range from 0 to 400°C the ξ_β-phase is characterized by extrinsic conductivity. The mean activation energies of the admixture levels of commercial alloys, calculated from temperature dependences of σ and ξ_x, are in a satisfactory agreement with each other and are approximately equal to 0.2 ev. Temperature investigations of pure specimens (at 20 - 400°C and in some cases 700°C) have shown that the ξ_β-phase is characterized by extrinsic conductivity, which at 350°C passes over into intrinsic conductivity; the forbidden band width is then close to 1 ev. Conductivity of β-leboite, sinthesized from commercial materials, has a hole nature; this is caused by the presence of about 0.2% Al. The ξ_β-phase, obtained from more pure materials, shows an electronic conductivity which is replaced by hole conductivity when 0.1% Al is added. All bi-phase specimens containing β-leboite and silicon, show semiconductor properties. There are 5 figures.

S/849/62/000/000/014/016
A006/A101

AUTHORS: Igishev, V. N., Gel'd, P. V.

TITLE: Electric conductivity of iron alloys with silicon at high temperatures

SOURCE: Vysokotemperaturnyye metallokeramicheskiye materialy, Inst. metalloker. i spets. spl. AN Ukr. SSR, Kiev, Izd-vo AN Ukr. SSR, 1962, 133 - 139

TEXT: The authors present results of measuring the specific electric resistivity of iron alloys with silicon, containing from 0 to 7 weight % Si, in a 20 to 1,000°C temperature range. The alloys were prepared from transformer iron, commercial silicon Kp-0(Kr-0) and special electrolytic iron with fragments of grade KM-1 single-crystal silicon. The alloys were melted in an induction furnace. Cylinder-shaped specimens 50 - 60 mm long were annealed prior to the measurements. The results obtained are illustrated by a number of graphs. It was found that solid solutions of Si in Fe, bi-phase alloys consisting of α and ξ -phases, and Fe-monosilicides, show metallic conductivity with a relatively low specific resistance. Ordered solid solutions, whose composition approaches

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Electric conductivity of iron alloys with... S/849/62/000/000/014/016
A006/A101

Fe_3Si, show a negative temperature coefficient of resistivity in paramagnetic state, and can be associated with ferromagnetic semiconductors. As the increasing Si content in the particular FeSi-Si system approaches compositions, corresponding to monosilicide, a gradual degeneration of metallic conductivity to semiconductivity is observed. This is caused by an increased content of the β-phase. Annealed alloys, which are rich in β-leboite, are typical semiconductors up to temperatures of $\beta \rightarrow \alpha$ transformation. Metastable α-leboite shows metallic conductivity with a low temperature coefficient of resistivity. At temperatures 650 - 700°C the latter melts and β-leboite and silicon are formed. There are 6 graphs.

Card 2/2

3957

S/126/62/013/001/018/018
E039/E535

18.1100

AUTHORS: Shtol'ts, A.K. and Gel'd, P.V.

TITLE: Solid solutions of germanium in α-iron

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.1, 1962, 159-160

TEXT: This work is aimed at producing more precise data on, and elucidating the nature of, the formation of alloys of germanium in α-iron. The structure and phase characteristics of the alloys are studied by X-ray analysis, metallography and densitometer analysis and, in addition, values of the microhardness and Curie temperature are obtained. The alloys were prepared in a vacuum furnace. X-ray analysis shows that the lattice parameters increase from 2.8606 kX for pure iron to 2.8775 kX for an alloy containing 16 at.% Ge. With increasing content of germanium the microhardness of the alloys quickly increases from 120 kg/mm^2 for 2 at.% Ge to 435 kg/mm^2 for 16 at.% Ge. All the alloys investigated are ferromagnetic. The Curie temperature for these alloys decreases with increasing content of germanium from 750°C for pure iron to 677°C for

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

18.1141

AUTHORS: Krentsis, R.P., and Gel'd, P.V.

TITLE: The thermal capacity of iron silicides in the range 55 to 300 °K

PERIODICAL: Fizika metallov i metallovedeniye, v.13, no.2, 1962, 319-320

TEXT: The temperature dependence of the thermal capacity of the silicides of iron (Fe_3Si; Fe_5Si_3; FeSi; $FeSi_2$; and $FeSi_{2.33}$) was studied with the aid of a low temperature adiabatic calorimeter. The alloys were produced by melting single crystal silicon and reduced iron in a quartz crucible under argon in an induction furnace. Subsequent heat treatment produced practically single phase alloys. The samples were then ground in an agate mortar and transferred to a calibrated calorimeter for thermal capacity measurements. For Fe_3Si and Fe_5Si_3 the experimental values of entropy are greater than the calculated values, while in the case of $FeSi_2$ and $FeSi_{2.33}$ the calculated values are the greater. Good agreement is obtained for FeSi.

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The thermal capacity of iron ....

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

The temperature dependence of the average atomic thermal capacity is shown graphically. The curves fall into two groups. In the first group belongs the ordered solid solution of silicon in iron Fe_3Si and Fe_5Si_3. In this case there is little deviation from the calculated curve and they follow the Dulong and Petit law as in the case of iron. In the second group $FeSi_2$ and $FeSi_{2.33}$ the thermal capacity does not conform to the calculated curve but becomes even less than silicon at low temperatures (below about 100 °K). In the case of FeSi the thermal capacity curve falls steeply with decreasing temperature, becoming less than silicon at about 80 °K while at temperatures above 200 °K its thermal capacity approaches that of iron. No anomaly is observed in the thermal capacity curves in the temperature range 55-300 °K for the materials studied.
There are 1 figure and 1 table.
ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M.Kirova
(Ural Polytechnical Institute imeni S.M. Kirov)
SUBMITTED: May 29, 1961

Card 2/2

L 12614-65 EWT(m)/EPF(c)/EWP(t)/EWP(b) Pr-4/Pad JD/HW

ACCESSION NR: AR4041599 S/0137/64/000/005/I018/I019

SOURCE: Ref. zh. Metallurgiya, Abs. 51115

B

AUTHOR: Gel'd, P. V.; Gol'tsov, V. A.

TITLE: Influence of phase transitions on speed of penetration of hydrogen into austenite

CITED SOURCE: Sb. Vliyaniye vodoroda na sluzhebn. svoystva stali, Irkutsk, 1963, 123-130

TOPIC TAGS: austenite, phase transition, hydrogen penetration

TRANSLATION: Influence of $\gamma \rightarrow \alpha \rightarrow \gamma$-transformation in alloys Fe-Ni (12 - 29% Ni) and $\gamma \rightarrow \gamma$ transformation in alloy Fe-Mn (15% Mn) on hydrogen permeability of austenite was studied. The high sensitivity of diffusion of H in metal to defects in crystal lattice of metal was experimentally determined. It was established that internal work hardening taking place during phase transitions leads

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L 12611-63
ACCESSION NR: AR4041599

to growth of activation energy and of pre-exponential factor of temperature dependency of speed of penetration of H into austenite. Between degree of phase work hardening, activation energy and pre-exponential factor there exists parallelism. Apparently this is connected with the fact that defects of crystal lattice are unique "traps" of H and that increase of degree of work hardening leads to growth of density of these "traps". Gradual increase of temperature of annealing to 900 - 1000° leads to correction of structure and restores characteristics of process of penetration of H to values peculiar to equilibrium austenite, which can be connected with correction of structure. Bibliography: 12 references.

SUB CODE: MM ENCL: 00

Card 2/2

GEL'D, P.V.; LYUBIMOV, V.D.

Activation energy of the process of autodiffusion of niobium in its oxides. Izv. SO AN SSSR no.7 Ser.khim.nauk no.2:79-85 '63.
(MIRA 16:10)

1. Ural'skiy filial AN SSSR, Sverdlovsk.

SHTOL'TS, A.K.; GEL'D, P.V. (Sverdlovsk)

Phase constituents of the system iron - germanium. Zhur. fiz. khim. 36 no.11:2400-2405 N'62. (MIRA 17:5)

1. Ural'skiy politekhnicheskiy institut imeni Kirova, kafedra fiziki.

L 19904-63 EWP(q)/EWT(m)/EWP(B)/BDS AFFTC/ASD JD/JG

ACCESSION NR: AP3005816 S/0226/63/000/004/0076/0078

AUTHORS: Gel'd, P. V. ; Lyubimov, V. D.

TITLE: Mobility activation energy of Nb and C in metallic niobium and it its carbides

SOURCE: Poroshkovaya metallurgiya, no. 4, 1963, 76-78

TOPIC TAGS: Nb, C, carbide, mobility, activation energy

ABSTRACT: The diffusion processes of Nb and C in both metallic niobium and its carbides were investigated. Niobium alloy containing 0.94% Ta and 0.04% O_2 was used in the study of Nb-95 diffusion. The total porosity of samples was 13% and 10%, and the experiments were made at 1700-2100C. The results obtained followed the exponential relationships. Activation energy was only slightly affected by the porosity, its average value being 346.4 Kj/mole. The activation energy of the niobium diffusion in carbide was 35% smaller. Experiments on carbon diffusion in Nb were made at 900-1100C. It was found that the coefficient of carbon diffusion varied exponentially with temperature. The average activation energy of C diffusion in carbides was about 131.2-135.3 Kj/g.atom. Activation energy of carbon diffusion in metal and in carbides differed very little: in $NbC_{0.98}$ it equaled 132.4 Kj/g.

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L 19904-63

ACCESSION NR: AP3005816

atom; in $NbC_{0.5}$ - 122.1 Kj/g.atom. This was due to the fact that Nb atoms in its carbides form dense lattices (cubic - in the first, hexagonal - in the second case) the interstices of which are similar in size. Orig. art. has: 4 figures and 4 formulas.

ASSOCIATION: Institut khimii Ural'skogo filiala AN SSSR (Institute of Chemistry, Ural Branch, Academy of Sciences, SSSR)

SUBMITTED: 14Apr62 DATE ACQ: 06Sep63 ENCL: 00

SUB CODE: ML NO REF SOV: 005 OTHER: 002

Card 2/2

L 10602-63 EWT(1)/BDS AFFTC/ASD/ESD-3 Pi-4 IJP(C)

ACCESSION NR: AP3001050 S/0148/63/000/004/0098/0103

AUTHOR: Ryabov, R. A.; Gel'd, P. V.; Gol'tsov, V. A. 61

TITLE: Influence of crystal lattice defects on hydropermeability of metals

SOURCE: IVUZ. Chernaya metallurgiya, no. 4, 1963, 98-103

TOPIC TAGS: crystal lattice defects, hydropermeability of metals, hydrogen extraction, isotropic steel, saturated cylindrical steel, active hydrogen, hydrogen, Cottrell clouds, diffusion mobility

ABSTRACT: The kinetics of hydrogen extraction from isotropic and saturated cylindrical steel specimens is explained by the complex energy state of active hydrogen. Defects in crystal lattice structure exert an extremely strong influence on hydrogen distribution (Cottrell clouds) and on diffusion mobility. Orig. art. has: 6 equations, 4 figures, 8 references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural polytechnic institute)

SUBMITTED: 15Jun62 DATE ACQD: 11Jun63 ENCL: 00

SUB CODE: 00 NO REF SOV: 007 OTHER: 001

Card 1/1

ACCESSION NR: AR4041601 S/0137/64/000/005/I020/I020

SOURCE: Ref. zh. Metallurgiya, Abs. 5I122

AUTHOR: Gel'd, P. V.; Ryabov, R. A.

TITLE: Kinetics and mechanism of process of diffusion of hydrogen in metals

CITED SOURCE: Sb. Vliyaniye vodoroda na sluzhebn. svoystva stali. Irkutsk, 1963, 116-122

TOPIC TAGS: metal, steel, hydrogen diffusion, kinetics, mechanism

TRANSLATION: In examining the diffusion of H in metals (in steel) the simultaneous existence of different degrees of connection of H with matrix of metals is assumed. The case was investigated, when besides rapidly diffusing H (whose coefficient of diffusion is equal to D_1) and initial content of $B_{0,1}$, there is slowly diffusing H with characteristics D_2 and $B_{0,2}$, respectively. For indicated cases equations were obtained: $B_1/B_{0,1} = C \exp(-kD_1t)$; $B_2/B_{0,2} = C \exp(-kD_2t)$, where B_1 and B2 are the content of each phase at moment of time t; C and k are constants depending on conditions of experiment. Graphs are given illustrating the com-

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ACCESSION NR: AR4041601

plicated character of degassing. It was shown that quantity of H freed up to any moment of time is increased with increase of share of rapidly diffusing H. Expressed hypotheses are confirmed by dependence of coefficient of diffusion on temperature.

SUB CODE: MM ENCL: 00

Card 2/2

VOLKOVA, N.M. (Sverdlovsk); ALYAMOVSKIY, S.I. (Sverdlovsk); GEL'D, P.V. (Sverdlovsk)

Concentration stability limits of vanadium carbide at 1800° C. Izv. AN SSSR. Met. i gor. delo no.5:134-140 S-O '63. (MIRA 16:11)

BR

ACCESSION NR: AR4041600 S/0137/64/000/005/I019/I020

SOURCE: Ref. zh. Metallurgiya, Abs. 5I121

AUTHOR: Gel'd, P. V.; Gol'tsov, V. A.; Sklyuyev, P. V.; Kvater, L. I.

TITLE: Influence of coagulation of carbides on water permeability of steel

CITED SOURCE: Sb. Vliyaniye vodoroda na sluzhebn. svoystva stali. Irkutsk, 1963, 140-147

TOPIC TAGS: steel, water penetration, hydrogen penetration, carbide, carbide coagulation

TRANSLATION: Regularities of hydrogen permeability of steel 80KhNIM and steel 34KhNIM with initial structures of martensite, bainite and perlite in interval of 280 - 000° with pressure drop of 10- 760 mm Hg for 20, 40, 60 and 100 hours were studied. Water permeability of steel with initial structure of martensite and bainite annealed at 650°, turns out to be higher than for steel

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with platy separations of carbides with intial perlitic structure as a result of coagulation of carbides. Maximum water permeability of steel 80KhNlM annealed at 650° is observed during holding $\geqslant$ 20 hr of samples with initial perlite structure and $\geqslant$ 40 hr of samples with initial structure of martensite and bainite at the same temperature. Conversion of platy form of carbides into granular noticeably increases water permeability in even greater measure, the higher the content of C in steel. For increase of water permeability of steel it is considered expedient first to carry out decomposition of austenite up to obtaining of martensite of lower bainite, and then to increase temperature to 650 - 680° for the purpose of formation of structure of granular cementite.

SUB CODE: MM ENCL: 00

Card 2/2

KRENTSIS, R.P.; GELD, P.V.

Certain thermophysical characteristics of iron silicides. Sbor. nauch. trud. Ural. politekh. inst. no.126:95-97 '63
(MIRA 17:8)

GEL'D, P.V.; TSKHAY, V.A.

Average densities of valence electrons in FeO_x, VO_x, and TiO_x.
Zhur.strukt.khim. 4 no.2:235-244 Mr-Ap '63. (MIRA 16:5)

1. Ural'skiy filial AN SSSR, Institut khimii, Sverdlovsk.
(Metallic oxides) (Electrons) (Valence (Theoretical chemistry))

RYABOV, R.A.; GEL'D, P.V.

Kinetics of gas removal from steel products. Izv. vys. ucheb. zav.; chern. met. 6 no.2:111-114 '63. (MIRA 16:3)

1. Ural'skiy politekhnicheskiy institut.
(Steel ingots—Hydrogen content)
(Annealing of metals)

RYABOV, R.A.; GEL'D, P.V.; GOL'TSOV, V.A.

Effect of crystal lattice defects on hydrogen penetration in metals. Izv. vys. ucheb. zav.; chern. met. 6 no.4:98-103 '63. (MIRA 16:5)

1. Ural'skiy politekhnicheskiy institut.
(Steel—Hydrogen content) (Crystal lattices—Defects)

SIDORENKO, F.A.; GEL'D, P.V.

Nature of the $\mathcal{E}$-phase in the system Fe - Si. Izv. vys. ucheb. zav.; chern. met. 6 no.7:140-148 '63. (MIRA 16:9)

1. Ural'skiy politekhnicheskiy institut.
(Iron-silicon alloys—Metallography)
(Phase rule and equilibrium)

GEL'D, P.V.; PETRUSHEVSKIY, M.S.; KORSHUNOV, V.A.; GERTMAN, Yu.M.

Properties of liquid manganese-silicon alloys. Izv. vys. ucheb. zav.; chern. met. 6 no.7:160-161 '63. (MIRA 16:9)

1. Ural'skiy politekhnicheskiy institut.
(Manganese-silicon alloys)

KRENTSIS, R.P.; GEL'D, P.V.; KALISHEVICH, G.I.

Thermochemistry of iron silicides. Heat capacity, enthalpy and entropy of FeSi and Fe_5Si_3. Izv. vys. uchab. zav.; chern. met. 6 no.9:161-168 '63. (MIRA 16:11)

1. Ural'skiy politekhnicheskiy institut.

KRENTSIS, R.P.; GEL'D, P.V.; KALISHEVICH, G.I.

Thermochemistry of iron silicides. Heat capacity, enthalpy and entropy of lebeauite. Izv. vys. ucheb. zav.; chern. met. 6 no.11: 146-152 '63. (MIRA 17:3)

1. Ural'skiy politekhnicheskiy institut.

S/078/63/008/003/011/020
B117/B186

AUTHORS: Shveykin, G. P., Gel'd, P. V., Alyamovskiy, S. I.

TITLE: Conditions for the formation of niobium oxycarbides

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 8, no. 3, 1963, 689-696

TEXT: The phase composition of the intermediates formed during the reaction between niobium oxides and carbides at different temperatures and pressures was studied by x-ray diffraction analysis. To produce specimens, mixtures of oxides and carbide were briquetted (at 2.5 - 3 tons/cm^2) and sintered at 1400-1900°C in vacuo ($\sim 10^{-3}$ mm Hg) or in pure argon ($\sim$1 atm) for 10-225 min. The specimens made from the lowest oxides and carbide sintered in vacuo contained no oxycarbide. In the specimens produced in argon, however, an oxycarbide phase was formed due to high partial carbon oxide pressure near the reaction zone. Carbon atoms enter the niobium monoxide lattice to a limited extent or not at all. The formation of niobium oxycarbides is due to penetration of oxygen into the carbide lattice. In the Nb - C - O system, oxycarbides

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Conditions for the formation of ...

may occur in the cubic "NbC" or the hexagonal "$NbC_{0.5}$" form. Both modifications have wide ranges of homogeneity which become narrower with increasing temperature and decreasing pressure. The stability of oxycarbides also depend temperature and pressure in this way. Oxycarbides may be formed as intermediates when sintering large and compact NbC + Nb_2O_5 briquettes in vacuo. There are 1 figure and 4 tables.

SUBMITTED: February 16, 1962

L 10397-63 EWP(q)/EWT(m)/BDS--AFFTC/ASD--JD
ACCESSION NR: AP3003475 S/0078/63/008/007/1639/1644

54
53

AUTHOR: Dubrovskaya, L. B.; Gel'd, P. V.

TITLE: Homogeneity range and nature of chromium disilicide

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 7, 1963, 1639-1644

TOPIC TAGS: chromium disilicide, chromium monosilicide, silicon, homogeneity, CrSi sub (2 + x), lattice parameters, photomicrographic method, phase composition, densimetric method, substitutional solid solution, atoms per unit cell, heat resistance, chemical resistance, electrical conductivity

ABSTRACT: Since chromium disilicide possesses such desirable properties as high heat, oxidation, and acid resistance, high thermal emf and electrical conductivity, and a negative temperature coefficient of conductivity below 300--400C, additional study of the compound has been conducted. An attempt was made to define more accurately than in previous studies the composition range of stability of CrSi sub (2 + x) and to determine the nature of this variable-composition phase. Twelve samples containing 50--55.5% Si were prepared by smelting vacuum-distilled

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L 10397-63
ACCESSION NR: AP3003475

Cr metal with Si single crystals in corundum crucibles in an argon atmosphere. The phase composition of the alloys was determined by photomicrographic analysis and x-ray analysis by the Debye-Sherrer method; the lattice parameters, by x-ray analysis; and the density, picnometrically with the middle fraction of refined kerosene. The number of Si and Cr atoms per unit cell was calculated from the experimental densities of one-phase alloys. A discrepancy between the micrographic and x-ray data was noted. The sensitivity of the x-ray method was found to be relatively low because the lattice parameters of chromium disilicide were quasi-independent of its composition. Hence preference was given to the photomicrographic data. The density data confirmed the micrographic data. The experimental and calculated plots of density versus composition shown in Fig. 1 of the Enclosure lead to the conclusions that 1) the limit of coexistence between chromium monosilicide and disilicide is about 51% Si, and Si segregation begins at about 53% Si; and 2) the CrSi sub (2 + x) homogeneous phase is a substitutional solid solution. Consideration of the change in the lattice parameters of CrSi sub (2 + x) with x also exludes the possibility of an interstitial and of subtraction solid-solution structure for CrSi sub (2 + x). Thus, the concurring results of microscopic and densimetric studies point to the existence of a homogeneous substitutional solid solution within the CrSi sub 1.90 (50.7% Si) to

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L 10397-63
ACCESSION NR: AP3003475

0

CrSi sub 2.05--2.09 (52.5--53.0% Si) range. The total number of atoms per unit cell remained constant within the above range, but the number of Cr atoms per unit cell and of Si atoms per unit cell varied from 3.08 to 2.90 and from 5.82 to 6.06, respectively. Orig. art. has: 3 figures, 3 tables, and 6 formulas.

ASSOCIATION: none

SUBMITTED: 19Jan62 DATE ACQ: 02Aug63 ENCL: 01

SUB CODE: 00 NO REF SOV: 010 OTHER: 006

Card 3/4

L 18166-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD
ACCESSION NR: AP3004358 S/0078/63/008/008/2000/2001

AUTHORS: Alyamovskiy, S. I.; Shveykin, G. P.; Gel'd, P. V.

TITLE: Oxidation of niobium and its lower carbide 21 57

SOURCE: Zhurnal neorganicheskoy khimii, v. 8, no. 8, 1963, 2000-2001

TOPIC TAGS: niobium, niobium carbide.

ABSTRACT: The intermediate products of niobium oxidation were analyzed in order to clarify the possibility of the existence of niobium oxycarbides. X-ray analysis of the hexagonal carbide Nb_2C shows that the index lines 101, 110, 112 as well as some others are washed out. A further oxidation of this sample for a period of four hours resulted in the formation of a new phase. X-ray of this new phase shows that it is similar to the X-ray of Nb_2C, but that it has additional lines which are located close to the high-interference lines corresponding to a lower carbide. By using V. I. Mikheyev's (Rentgenometricheskiy opredelitel' mineralov, Moskva, Gosgeologizdat, 1957) homolog method, it was possible to obtain an X-ray of the new phase and determine its elemental structure. The periods of the rhombic structure of the new phase were as follows: $a = 5.37_1$ kx, $b = 4.95_6$ kx, $c = 3.12_9$ kx. The comparison of the above values with the hexagonal

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L 18166-63
ACCESSION NR: AP3004358

values led to the conclusion that its composition can be described with the formula $NbC_{\sim 0.4}$. The spectral composition of Nb_2C and $NbC_{\sim 0.4}$ is practically the same. Apparently this shift of the hexagonal structure takes place with the addition of oxygen and nitrogen. Oxygen alone does not effect this shift. An analogous phase is formed on the basis of lower carbide V_2C having a structure similar to Nb_2C. Orig. art. has: no graphics.

ASSOCIATION: none

SUBMITTED: 26Feb63 DATE ACQ: 21Aug63 ENCL: 00

SUB CODE: CH NO REF SOV: 002 OTHER: 003

Card 2/2

S/126/63/015/001/007/029
E111/E183

AUTHORS: Gel'd, P.V., and Krentsis, R.P.

TITLE: Some thermo-physical characteristics of iron silicides

PERIODICAL: Fizika metallov i metallovedeniye, v.15, no.1, 1963, 63-71

TEXT: Previously obtained data on the specific heats and entropies of Fe_3Si, Fe_5Si_3, FeSi, $FeSi_2$ and $FeSi_{2.33}$ at 55-1925 °K are used to calculate the characteristic temperatures and entropies of melting of these compounds. A comparative analysis of these properties in relation to the composition and structure of the compounds is presented, and certain specific features of the melting process and short-range order in liquid iron silicides are discussed. An iron monosilicide crystal can be considered as made up of FeSi groups, with both metallic and covalent bonds, and this is reflected in the temperature dependence of the specific heat of FeSi: with falling temperature gradual "freezing" must occur of atomic vibrations in these quasi-molecular groups and they begin to oscillate as closed units. Both thermal and electrical properties

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of the higher silicides of iron confirm that here inter-atomic bonding is unequal and conditions for producing lattice vibrations are different. Both heats and entropies of fusion show considerable deviations between observed values and those calculated by some of the usual methods. The experimental data indicate that on melting iron silicides not only is the long-range order destroyed, but a substantial change occurs in the nature of the interaction between particles, character of structural units and degree of short-range order. This applies particularly to Fe_3Si in which some of the metallic bonds change to covalent on fusion; as a result, stable, quasi-molecular FeSi groups are formed. Fusion of α-lebeauite is similar, but in the case of monosilicide it consists merely in a certain structural disordering of the system. The authors emphasise that the evaluation of the extent of disordering during fusion solely by analysis of the relative deviation of the latent-heat values from the additivity law is adequate only when no substantial change in the nature of particle interaction occurs.
There are 3 figures and 1 table.

Some thermo-physical ... S/126/63/015/001/007/029
E111/E183

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M. Kirova
(Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: June 14, 1962

Card 3/3

SHTOL'TS, A.K.; GEL'D, P.V.; ZAGRYAZHSKIY, V.L.

Region of homogenous structure and certain properties of the β-phase in the system Fe - Ge. Fiz. met. i metalloved. 16 no.1:130-132 Jl'63. (MIRA 16:9)

1. Ural'skiy politekhnicheskiy institut imeni Kirova.
(Iron-germanium alloys--Metallography)

SHTOL'TS, A.K.; GEL'D, P.V.; ZAGRYAZHSKIY, V.L.

Certain electric and magnetic properties of the β - phase of the system Fe - Ge. Fiz. met. i metalloved. 16 no.2:198-204 Ag '63. (MIRA 16:8)

1. Ural'skiy politekhnicheskiy institut im. S.M. Kirova
(Iron-germanium alloys--Electric properties)
(Phase rule and equilibrium)

GEL'D, P.V.; GOL'TSOV, V.A.; SHTEYNBERG, M.M.

Effect of intraphase hardening on hydrogen absorption in manganese austenite. Fiz. met. i metalloved. 16 no.3:394-402 S '63. (MIRA 16:11)

1. Ural'skiy politekhnicheskiy institut imeni Kirova.

TSKHAY, V.A., GEL'D, P.V.

Shielding of Me-Me bonds in equiatomic transition metal oxides and carbides with a NaCl structure. Fiz. met. i metalloved. 16 no.3:493-494 S '63.

Homogeneity concentration areas of the IV and V group transition metals with a NaCl structure. 495-496 (MIRA 16:9)

1. Institut khimii Ural'skogo filiala Akademii nauk SSSR.

GEL'D, P.V.; GOL'TSOV, V.A.; RYABOV, R.A.; SHTEYNBERG, M.M.

Interaction of the parameters of hydrogen absorption by precipitation-hardened austenite. Fiz. met. i metalloved. 16 no.4:610-611 O '63. (MIRA 16:12)

1. Ural'skiy politekhnicheskiy institut imeni Kirova.

BAUM, B.A.; GEL'D, P.V.; SUCHIL'NIKOV, S.I.

Electric conductivity of liquid chromium silicides. Fiz. met. i metalloved. 16 no.6:939-941 D '63. (MIRA 17:2)

1. Ural'skiy politekhnicheskiy institut imeni Kirova.

YESIN, O.A.; GEL'D, P.V.; POPEL', S.I.; NIKITIN, Yu.P.

Review of "Physical chemistry" by A.A. Zhukhovitskii and L.A. Shvartsman. Zhur. fiz. khim. 37 no.6:1435-1436 Je '63. (MIRA 16:7)

1. Ural'skiy politekhnicheskiy institut imeni S.M. Kirova. (Zhukhovitskii, A.A.) (Shvartsman, L.A.) (Chemistry, Physical and theoretical)

KALISHEVICH, G.I.; GEL'D, P.V.; KRENTSIS, R.P.

Heat capacity, enthalpy, and entropy of cobalt monosilicide.
Teploflz. vys. temp. 2 no.1:16-20 Ja-F '64. (MIRA 17:3)

1. Ural'skiy politekhnicheskiy institut.

ACCESSION NR: AP4029537 S/0149/64/000/002/0146/0151

AUTHOR: Zelenin, L. P.; Sidorenko, F. A.; Gel'd, P. V.

TITLE: Structural characteristics of the ε-phase of the Co-Si system

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 2, 1964, 146-151

TOPIC TAGS: cobalt, silicon, ε-phase, silicide, metallographic investigation, x-ray investigation, densitometric investigation

ABSTRACT: In this paper the authors studied the concentration limits of stability of single-phase monosilicide and the character of filling its crystalline lattice with component atoms. Microphotographs of Co-Si alloys with various silicon contents are presented. The authors found that by metallographic, x-ray, and densitometric methods, the width of the homogeneity region of ε-phase of the Co-Si system at 800-1100° (31.40-32.80% Si) and at 1200° (30.96-33.06 Si) is more accurately defined. It is shown that when $n_{Si} > n_{Co}$, cobalt monosilicide, it is a solid solution of subtraction in the cobalt sublattice. The maximum defectiveness for an alloy saturated with silicon at 1100° reaches 2%. When $n_{Si} < n_{Co}$, a substitution of silicon atoms by cobalt atoms occurs which is accompanied by formation of the small amount of defects in the silicon sublattice. Equiatomic cobalt monosilicide is characterized

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