Magnetic Analysis of Molten Iron Base Alloys

curve for the dependence of the magnetic susceptibility on concentration is smooth (Fig.3). Thus, in spite of the fact that cobalt is very close in its properties to iron, it does not form ideal solutions with iron. In liquid Fe-Co solutions there are regions which differ from one another structurally. The difference in solution structure also leads to different behaviour in chemical reactions, in particular during solution of gases. There are 3 figures, 13 references, 11 of which are Soviet, 2 English.

SUBMITTED: May 10, 1958.

32-3-20/52

AUTHORS: Vertman, A.A., Samarin, A.M.

TITLE: The Measuring of the Magnetic Susceptibility of Liquid Metals (Izmereniye magnitnoy vospriimchivosti zhidkikh metallov)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 3, pp. 309-310 (USSR)

ABSTRACT: An apparatus, which is based upon Faraday's measuring method was constructed. The modification of the weight of the test sample in the magnetic field is proportional to magnetic susceptibility (with the volume of the sample being constant). In a liquid state the volume depends on temperature, but magnetic properties are determined by the composition of the molten metal. The device described makes it possible to measure the magnetic properties of the metals to be investigated by carrying out comparative determination of the tension and susceptibility of standard samples. The result is computed according to a formula. A detailed description of the electromagnetic scales of the device (operating with an accuracy of up to ± 0.001 g) has previously been given [Refs.6,7]. By means of the device described determinations of susceptibility were carried out for liquid alloys of iron-

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The Measuring of the Magnetic Susceptibility of Liquid Metals

32-3-20/52

nickel, nickel-cobalt, and iron-silicon at 1700° C. There are 1 figure, and 7 references, 6 of which are Slavic.

ASSOCIATION: Institute for Metallurgy AS USSR (Institut metallurgii Akademii nauk SSSR)

AVAILABLE: Library of Congress

1. Liquid metals-Magnetic properties 2. Electromagnetic scales-Applications

Card 2/2

SOV/ 20-120-2-22/63

AUTHORS: Vertman, A.A., Samarin, A.M., Corresponding Member, Academy of Sciences, USSR

TITLE: On the Form of Silicon in Liquid Iron (O forme sushchestvovaniya kremniya v zhidkom zhelezo)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol. 120, Nr 2, pp. 309 - 310 (USSR)

ABSTRACT: The problem of the existence of elements dissolved in liquid metals is, in spite of its great importance for the practice of metallurgical engineering, one of the least investigated. Experimenting at high temperatures is difficult and furthermore most researchers approached this problem from the standpoint of formal thermodynamics (Reference 1). The authors describe the methods by which data on the structure of liquid metals can be obtained (Reference 2-4). For this purpose the authors measured the magnetic susceptibility of liquid Fe-Si alloys (from 0 to 60% by weight of Si). The results of measurement in a special apparatus (Reference 5) at 1600°C are shown in relative

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units in figure 1. From it follows that the magnetic susceptibility χ is the lower the higher the degree of order in the solution. A minimum for χ was registered for melts containing 34% Si and corresponding to a stable chemical compound FeSi. This iron- silicide is stable at the steel-melting temperature (1500-1700°). Its presence is also confirmed by other characteristics (References 6-8). It was reported that the Kurnakov point (References 9-10) which characterizes the transformation order-disorder in alloys of the Fe-Si system and in the alloy Fe-Al-Si lies close to the melting point or possibly also higher. Conclusions: 1) The magnetic susceptibility of the melts of the Fe-Si system has minimal values for compositions which correspond to the chemical compounds Fe_3Si, Fe_3Si_2 and $FeSi_2$. This is a direct proof of the existence of silicide-like structural formations in the melts. 2) The magnetic susceptibility in the melts decreases with an increase in the degree of order. It is minimal for chemical compounds and maximal for solutions with a complete mixture of atoms. 3) The structural changes in melts are connected with their chemical properties, especially with the

On the Form of Silicon in Liquid Iron SOV/ 20-120-2-22/63

gas solubility. There are 1 figure and 11 Soviet references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute for Metallurgy imeni A. A. Baykov, AS USSR)

SUBMITTED: January 13, 1958

1. Liquid metals--Properties 2. Liquid metals--Heating 3. Iron-silicon alloys--Magnetic factors 4. Silicon--Metallurgical effects

Card 3/3

5(4) SOV/20-123-3-31/54

AUTHORS: Glazov, V. M., Vertman, A. A.

TITLE: On the Behavior of the Antimonides of Aluminum, Gallium, and Indium in the Liquid State (O povedenii antimonidov alyuminiya, galliya i indiya v zhidkom sostoyanii)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 123, Nr 3, pp 492-494 (USSR)

ABSTRACT: The present paper investigates the temperature dependence of the magnetic susceptibility of the antimonides of aluminum, gallium, and indium in the liquid state; the data obtained are compared with several thermodynamic and kinetic properties of these compounds. Such investigations are also of practical importance. Reference is made to several previous papers. As initial materials AlSb, GaSb, and InSb samples were used, which were purified before the experiments by means of recrystallization by zones and by extraction. Magnetic susceptibility was determined by the Faraday (Faradey) method. The results obtained by these measurements are shown by a diagram. The temperature dependences of the magnetic susceptibility of AlSb, GaSb and InSb in the liquid state are very similar to one other. Therefore, equal or very similar processes probably take place when the three

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On the Behavior of the Antimonides of Aluminum, Gallium, and Indium in the Liquid State

SOV/20-123-3-31/54

compounds mentioned are heated. The curves for the temperature dependence of magnetic susceptibility have two maxima. The first curve for the temperature dependence of the magnetic susceptibility of the aforementioned substances agrees fairly accurately with the minimum of the curve for the temperature dependence of the free activation energy of viscous flow. The minimum of the curve of magnetic susceptibility corresponds approximately to those temperatures at which the curves of viscosity temperature dependence deviate from the regular course. The following conclusions can be drawn from the results of this paper and of previous investigations: at melting temperature, the above mentioned compounds have approximately the same structure of the near order as in the solid state. With rising temperature, the coordination number increases and at a certain temperature it approaches the dense packing. There are 1 figure and 7 references, 6 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)

PRESENTED: July 12, 1958, by G. V. Kurdyumov, Academician

SUBMITTED: June 28, 1958

Card 2/2

SOV/180-59-1-11/29

AUTHORS: Vertman, A.A. and Glazov, V.M. (Moscow)

TITLE: Magnetic Susceptibility of Aluminium-Antimony and Gallium-Antimony Alloys in the Liquid State (O magnitnoy vospriimchivosti splavov alyuminiy - sur'ma i galiy - sur'ma v zhidkom sostoyanii)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1959, Nr 1, pp 60-63 (USSR)

ABSTRACT: The work described was devoted to the study of reactions at various temperatures between components in the liquid alloys aluminium-antimony and gallium-antimony. This field is of interest because in such systems compounds with semiconducting properties are formed. The investigation was based on measurements of magnetic susceptibility at various temperatures for liquid alloys in the following composition ranges (at. %): 25-70 Sb, 75-30 Al; and 25-75 Sb, 75-25 Ga. The respective temperature ranges were about 1090-1350 and 710-1150°C. Faraday's method was used with a previously-described apparatus (Ref 3). The susceptibilities as functions of temperature are shown for the aluminium alloys (3g samples) in Fig 1 and for the gallium alloys (4g samples) in Fig 2 (curve numbers

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Magnetic Susceptibility of Aluminium-Antimony and Gallium-Antimony Alloys in the Liquid State

correspond to alloys numbers in the table). The curves fall continually with increasing temperatures except those for the 50-50 at.% samples (antimonides) (curves 4) which first rise, then fall, then rise and fall again. The authors explain the latter effect in terms of structural changes and dissociation, this being supported by published viscosity studies (Ref 5). They go on to consider the concentration-dependence of the magnetic susceptibility at various temperatures, shown in Figs 3 and 4 for the aluminium and gallium systems, respectively, together with the equilibrium diagrams. The minima on the susceptibility isotherms at 50 at.% became less pronounced with increasing temperature, and for the aluminium system the minimum disappears at 1300°C. The evidence of dissociation of AlSb and GaSb at 1200 and 1000°C respectively, is in line with that from viscosity studies.

VERTMAN, A.A.

18(5) PHASE I BOOK EXPLOITATION SOV/3388

Linchevskiy, Boris Vadimovich and Aleksandr Abramovich Vertman

Primeneniye vakuuma v proizvodstve stali (Use of Vacuum in Steel Making), Moscow, Metallurgizdat, 1960. 125 p. Errata slip inserted. 3,700 copies printed.

Ed.: A. Ye. Khlebnikov, Doctor of Technical Sciences, Professor; Ed. of Publishing House: Ya. D. Rozentsveyg; Tech. Ed.: L. V. Dobuzhinskaya.

PURPOSE: This book is intended for technical personnel at plants and scientific institutions. It may also be used by students of metallurgy and machine design.

COVERAGE: Theoretical principles and practical aspects of the vacuum production of steel and alloys in induction and arc furnaces are explained. Problems connected with the vacuum treatment of molten steel in the ladle and during teeming are discussed. Equipment for which design data are given includes degassing and teeming chambers, pumps, and instruments for measuring vacuum. Laboratory and field data are analyzed to

Card 1/3

Use of Vacuum in Steel Making SOV/3388

show the effect of vacuum melting and teeming of large ingots and vacuum treatment of molten steel on the properties of the finished metal. There are 60 references: 21 Soviet, 31 English, and 8 German.

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AVAILABLE: Library of Congress

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VK/mg
4-25-60

80975

S/180/60/000/03/002/030
E111/E352

18.9100

AUTHORS: Vertman, A.A., Samarin, A.M. and Yakobson, A.M. (Moscow)

TITLE: Structure of Liquid Eutectics

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, Nr 3, pp 17-21 (USSR)

ABSTRACT: V.I. Danilov and collaborators (Refs 1,2) carried out X-ray scattering work on liquid eutectic alloys. It was concluded (Ref 1) that in such liquids groupings exist with the structure of one of the components. The present authors do not consider the evidence unambiguous and mention another explanation (Ref 3) and views based on other experimental methods (Refs 5-8). The authors consider sedimentation-analysis methods promising for determining the size of "colonies" in the liquid state and describe their work using this technique with a centrifuge for Pb-Sn (K.P. Bunin -(Ref 9) had previously shown the applicability of this method). They used a high-temperature centrifuge, the two cups of which contained resistance furnaces. The rotating shaft was provided with rings and brushes, the wires passing through the hollow shaft and hollow cupholders. The test alloys, in a thick-walled steel crucible, were slowly

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Structure of Liquid Eutectics

heated to the required temperature. After rotating at 5 600 rpm for 15-30 min the crucibles were withdrawn and quenched in water. Furnace temperature was again measured, the experimental temperature being the mean of this and the first temperature. A reference sample was heated in an identical stainless-steel crucible and quenched in water; its composition was taken to be the initial composition of the centrifuged alloy. The crucibles with the centrifugal samples were cut in half vertically and drilled for analysis at different depths. The results (tabulated) showed that centrifuging produced significant concentration differences between top and bottom. From this the authors calculate the volume of the "colonies" to be 91×10^{-21} cm^3 at 225 °C, 130×10^{-21} at 380 and 109×10^{-21} at 800 for alloys with 76.0, 74.0 and 74.0 at.% Sn, respectively. Such a separation is possible if the colonies are of the order of 10^3 atoms. This agrees with Barten'yev's views (Ref 10).

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S/180/60/000/004/015/027
E193/E483

AUTHORS: Vertman, A.A. and Samarin, A.M. (Moscow)

TITLE: Viscosity of Liquid Silver-Copper Alloys

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, No.4, pp.95-98

TEXT: The temperature and concentration dependence of the dynamic and kinematic viscosities of silver, copper, and silver-copper alloys in the 1020 to 1420°C range, was determined. The results were in good agreement with those obtained by Gebhardt (Ref.3), Sauerwald (Ref.4,6) and Barfield (Ref.5). However, the shape of the viscosity isotherms obtained by the present authors was essentially different from those constructed by Gebhardt, probably because of the higher degree of oxidation of the alloys investigated by the latter author. The results of the present investigation are discussed in correlation with those obtained by other workers who have studied viscosity and other properties of eutectiferous systems, and certain conclusions regarding the structure of all alloys of this type are reached. Commenting on contradictory findings reported by various workers, the present authors disccunt the possibility that these differences are due to

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Viscosity of Liquid Silver-Copper Alloys

factors such as different degree of oxidation and volatization of the experimental alloys or different impurities' contents. They postulate that the properties of liquid, eutectiferous alloys are not necessarily determined by their properties in the solid state and that, as it has been demonstrated by Regel' and Gaybullayev (Ref.17), various types of eutectic alloys may exist, depending on the nature of the bond between the elementary particles of the two metals. The results of centrifuging experiments conducted by Bunin (Ref.9) and X-ray studies carried out by Danilov (Ref.8) support the view that liquid, eutectic alloys consist of micro-volumes, enriched by one of the components, these micro-volumes being surrounded by homogeneous solution. In alloys of the eutectic composition, the quantity of the solution surrounding the non-equilibrium micro-volumes, is at its minimum and it is this factor to which the present authors attribute the fact that the viscosity/concentration curves for the silver/copper system pass through a minimum at the point corresponding to the eutectic composition. This effect is explained in terms of the "solution energy", V/k. If V/k is $\gg 0$, the forces, bonding similar particles, are larger than those between dissimilar

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particles, in which case the least viscous part of the molten alloy should be represented by the boundary layer of the micro-volumes, since there the number of weak bonds of the AB type is minimum. If either A or B component is added to an alloy of the eutectic composition, the number of strong bonds between the similar particles increases and so does the viscosity of the alloy. Consequently, the shape of the viscosity isotherms for any given eutectiferous system will depend on the relative magnitude of the AA, BB and AB bonds. There are 6 figures, 2 tables and 19 references: 11 Soviet, 4 German and 4 English.

SUBMITTED: February 8, 1960

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S/180/60/000/006/023/030
E111/E335

AUTHORS: Vertman, A.A., Samarin, A.M. and Turovskiy, B.M. (Moscow)

TITLE: Structure of Liquid Alloys of the Iron-carbon System

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, No. 6, pp. 123 - 129

TEXT: The authors point out that in spite of their technical importance, views of liquid structures in the iron-carbon system are incomplete and contradictory. They now discuss thermodynamic data in relation to the structurally sensitive properties of iron-carbon alloys. Many investigations (Refs. 4-7) agree well and indicate considerable deviations from ideality. These can be due to heat of solution or entropy of mixing factors but thermodynamic data are insufficient for a detailed picture of the melts. If graphite is taken as the standard state (the possibility of iron solution in it must be recognised, Ref. 8), compounds which are mutually soluble are assumed to be formed (Ref. 9). If the standard state is

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Structure of Liquid Alloys of the Iron-carbon System

carbon-saturated iron negative deviations prevail at all concentrations. The authors consider that data are now available on which the alloys' structure can be explained more definitely. The results of Bunin (Ref. 10) and Konobeyevskiy (Ref. 8) suggest that relatively large groupings of graphite exist in liquid iron-carbon. This idea receives further confirmation from the work of Ivanov (Ref. 11) and of Khrapov and Chernobrovkin (Ref. 12). It appears (Refs. 15-17) that these eutectic colonies consist of thousands of atoms and the carbon formations have, in liquid cast iron, a diameter of the order of 10^{-6} cm (Ref. 18). In fact the colloidal view (Ref. 19) of liquid alloys is in line with experimental observations (Refs. 20, 21 or 22, 23, shown in Fig. 1, or Refs. 24, 25). Fig. 2 shows plots of resistivity of Fe-C alloys versus temperature at various carbon contents (0 - 5.25%). Viscosity results (Refs. 24, 25) provide further support (Fig. 3 shows the free-energy of viscous flow as a

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Structure of Liquid Alloys of the Iron-carbon System

function of carbon content in atomic %). So do magnetic-susceptibility measurements (Ref. 28) (Fig. 4 shows the 1550 and 1700 °C isotherms of susceptibility vs carbon content). Discussing the experimental evidence the authors conclude that at over 2.0% C from the melting point to 1700 °C Fe-C alloys are colloidal solutions and thermodynamic data on them cannot be extrapolated outside these concentrations. Thermodynamic investigations in which a tendency to immiscibility in Fe-C alloys was noted are supported by the physical-property studies considered. Of the authors, Vertman and Samarin have made previous contributions in this field (Refs. 16, 17, 18, 28). There are 4 figures and 29 references: 23 Soviet and 6 non-Soviet.

SUBMITTED: August 26, 1960

Card 3/3

S/020/60/132/03/23/066
B014/B011

AUTHORS: Vertman, A. A., Samarin, A. M., Corresponding Member of the AS USSR

TITLE: Viscosity of Liquid Nickel and Its Copper Alloys

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 3, pp. 572-575

TEXT: By way of introduction, the authors state that there are few publications available so far on the behavior of alloys in the liquid state that give rise to solid solutions. Reference is made in this connection to a paper by F. Gaybullayev (Ref. 1), who investigated the electrical conductivity of systems Ag-Au, In-Pb, and Bi-Sb. As was found there, the form of the isotherms of electrical conductivity does not differ from the one applying to solid solutions. Reference is further made to papers by K. Hondo and H. Endo (Ref. 2), who investigated the magnetic susceptibility of bismuth alloys with antimony in the temperature range of 20-680°C. These authors showed that the change of the isothermal magnetic susceptibility in dependence of concentration proceeds in a linear manner. The authors of the article under review

Viscosity of Liquid Nickel and Its Copper Alloys

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obtained a similar result for system Ni-Co (Ref. 3). Other articles (Refs. 4-6) showed the unlimited reciprocal solubility in the systems Au-Ag, Cu-Au, and Bi-Sb in the liquid state as well. The authors of the present paper studied the viscosity of system Ni-Cu in a high-temperature viscosimeter in helium atmosphere. The temperatures were measured with a Pt-PtRh thermoelement. Measurement results are shown in Table 1 and in the three diagrams (Figs. 1-3). It may be observed from Fig. 1 that the isothermal viscosity for temperatures 1500 and 1600°C proceeds in an almost linear manner. Fig. 2 is a graphic representation of the logarithm of the kinematic viscosity $\log \nu$ in dependence of $10^{-3}/T$. Experimental data can be described here by the relation $\log \nu = A/T + B$ (A, B are constant). The identity of the part played by nickel and copper atoms in the transmission of pulses may be observed from the results. With reference to an anomaly in the temperature dependence of the viscosity of nickel pointed out by D. K. Belashchenko, this anomaly is brought into connection with the desoxidizing action of the hydrogen in which measurements were made. This is said to have given rise to a reduction of solved oxygen content in nickel, which in its turn influences viscosity. The authors under-

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Viscosity of Liquid Nickel and Its Copper Alloys

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B014/B011

took experiments to check this assumption. Results are graphically depicted in Fig. 3. No anomaly in viscosity was detected. Finally, data concerning viscosity are given for practical purposes. Thus, nickel has a dynamic viscosity of 0.0410 poise at 1500°C. There are 3 figures, 1 table, and 13 references, 8 of which are Soviet.

ASSOCIATION: Institut metallurgii Akademii nauk SSSR (Institute of Metallurgy of the Academy of Sciences, USSR)

SUBMITTED: February 5, 1960

Card 3/3

VERTMAN, A.A.; SAMARIN, A.M.

Magnetic susceptibility of nickel, cobalt, and iron at high temperatures in the liquid state. Dokl.AN SSSR 134 no.2: 326-329 S '60. (MIRA 13:9)

1. Institut metallurgii im. A.A. Baykova Akademii nauk SSSR.
2. Chlen-korrespondent AN SSSR (for Samarin).
(Nickel--Magnetic properties)
(Cobalt--Magnetic properties)
(Iron--Magnetic properties)
(Liquid metals--Magnetic properties)

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S/020/60/134/003/018/020
B004/B067

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AUTHORS: Vertman, A. A., and Samarin, A. M., Corresponding Member of the AS USSR

TITLE: The State of Carbon in Liquid Cast Iron

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 3, pp. 629-631

TEXT: For determining the configuration of carbon in cast iron the authors centrifuged samples of liquid cast iron. The number of revolutions of the centrifuge was 1700-1900/min, acceleration was 320 g, and the duration of experiments was 1230-1275 min. The temperature was approximately 30-50°C above the melting point, and was kept constant at ±5°C by means of a Pt-PtRh thermocouple and an ЭПП-09 (EPP-09) electronic potentiometer. After the samples had been centrifuged, they were quenched in water and analyzed. As is shown by table 1, the centrifugal force causes an irregular distribution of carbon in the sample. Those parts of the sample which were nearer the rotational axis were enriched with C. From the angular velocity, the molecular weight of C and Fe, the

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The State of Carbon in Liquid Cast Iron

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B004/B067

difference between their densities, the initial concentration, the distance from the rotational axis, and from the temperature, the authors calculated the number of carbon particles in the liquid cast iron to be $2.5 \cdot 10^7$, the volume of the carbon colonies to be approximately 50.10^{-18} cm^3, and the particle diameter to be of the order of 10^{-6} cm, which corresponds to a colloidal, disperse system. They concluded therefrom that cast iron is a microheterogeneous system which is not in equilibrium, consisting of carbon-saturated iron and of carbon-saturated colonies. The authors mention papers by K. P. Bunin (Ref. 1), S. T. Konobeyevskiy (Ref. 3), and D. P. Ivanov (Ref. 2). There are 1 table and 8 Soviet references.

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

SUBMITTED: May 20, 1960

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18.8100 1138, 1418, 1413

S/180/61/000/002/006/012
E073/E535

AUTHORS: Vertman, A.A. and Samarin, A.M. (Moscow)

TITLE: Properties of Liquid Alloys with Unlimited Solubility of the Components in the Solid State

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.2, pp.83-87

TEXT: In measuring the electric conductivities of the systems Ag-Au and Bi-Sb, F. Gaybullayev ("Investigation of the electric conductivity of atomary solutions and eutectics in the liquid state", Dissertation, 1958, Leningrad Pedagogic Institute) found that the electric conductivity isotherms of liquid alloys do not differ from the corresponding curves pertaining to solid solutions: with increasing temperature the minimum which is characteristic on the curve for solid solutions flattens out and the dependence of the electric conductivity on the composition approaches the linear dependence. This was explained by the fact that scattering of the electron wave on account of the thermal oscillations becomes predominant as compared to the difference in the scattering ability of the components. A brief review of the work of other authors

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shows that so far only relatively low melting point systems were studied and, therefore, it was interesting to supplement the knowledge on the properties of liquid alloys of systems with unlimited solubility of the components in the solid state by studying alloys with high melting point components and, therefore, the systems Ni-Cu and Ni-Co were studied. The viscosity and the electric conductivity were measured by means of equipment described in an earlier paper (Ref.7) in a helium atmosphere. The temperature was measured by a platinum-platinum rhodium thermocouple placed directly under the crucible. The alloys were prepared by smelting under a vacuum of 10^{-2} mm Hg. The measured viscosity values are plotted in Fig.1a for Ni-Cu alloys and in Fig.1b for Ni-Co alloys in terms of $\nu \cdot 10^3$ centistokes vs. wt.% (Cu,Co). The values given were measured at the following temperatures: 1 - 1500°C, 2 - 1600°C, 3 - 1525°C, 4 - extrapolated values. The temperature dependence of the viscosity of the investigated alloys was slight. The experimental values obtained on the dependence of the logarithm of the kinematic viscosity, $\lg \nu$, of Ni and Cu on the inverse temperature are in good agreement with an equation of the type

Properties of Liquid Alloys ...

$$\nu = K \exp \frac{E}{RT}, \qquad \log \nu = \frac{A}{T} + B$$

where A, B and K are constants, E is the activation energy for viscous flow. The measured values of the electric conductivity are given in Fig.3a for Ni-Cu alloys, in Fig.3c for Ni-Co alloys, $\sigma \times 10^4$ ohm^{-1}, cm^{-1} vs. wt.% of Cu and Co, respectively. The measured values 1 were obtained for 1300°C, 2 - 1500°C, 3 -1600°C. The results are similar to those characteristic for solid solutions. However, in solid solutions the conductivity is determined basically by the differing ability of the atoms of each type to scatter electron waves, whilst in the liquid state the conductivity is mainly determined by the scattering caused by thermal oscillations. The difference in the electron structure of the atoms manifests itself also in the measured values of the magnetic properties of melts. Fig.4 shows the isotherm of the susceptibility, κ_o, in relative units, of liquid Ni-Co alloys. The experiments were carried out in a test-rig with electromagnetic scales inside an argon atmosphere using a field of 4000 Oe. The weight of the specimens did not exceed 2 g, the weighing accuracy was ± 0.1 mg.

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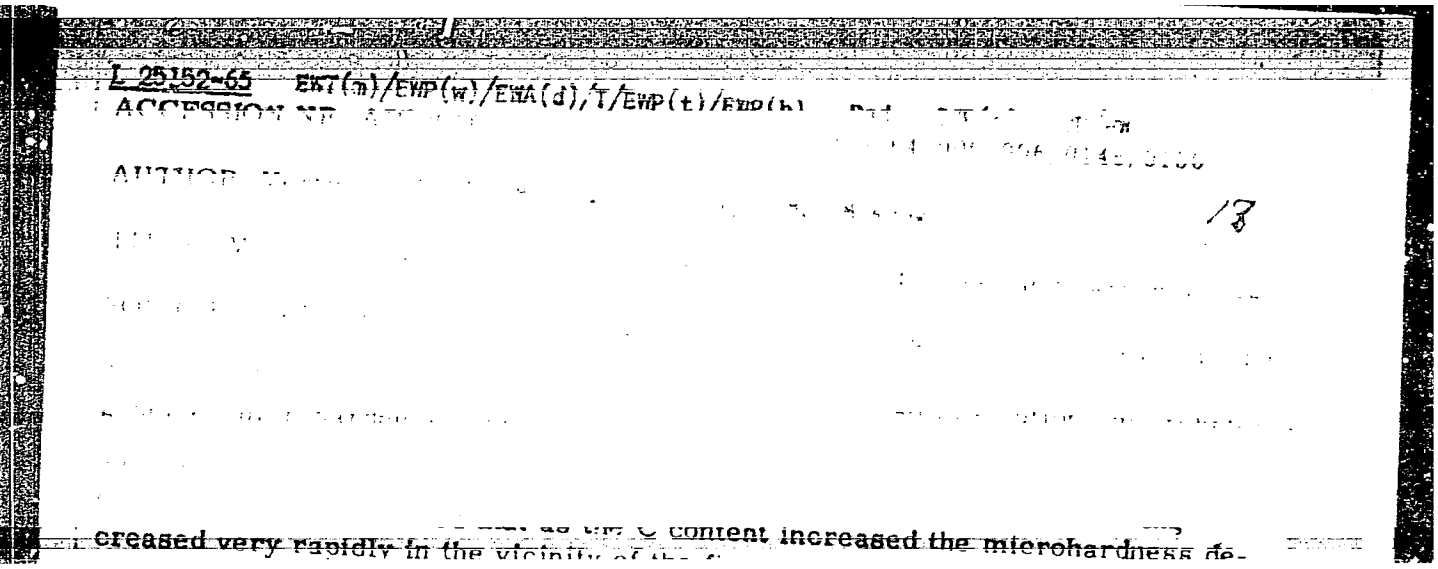
The same figure also contains values of the average magnetic moment of the nucleus determined by the average number of vacancies in the inner electron shell of the atoms in Ni-Co system alloys (data quoted from the work of Bozorth). The measurements were made at 1600°C. Calculated values of the concentration dependence of the changes in the free energy of viscous flow in liquid Ni-Cu alloys at 1500°C (1) and Ni-Co 1525°C (2) are plotted in Fig.5. In both cases there are slight negative deviations attributed to the difference in the electron structure and to s-d-interaction. This result confirms the results obtained by O. A. Yesin and his team (Ref.10) in investigating liquid Ni-Cu alloys by the e.m.f. method. There are 5 figures, 5 tables and 10 references: 3 Soviet and 7 non-Soviet.

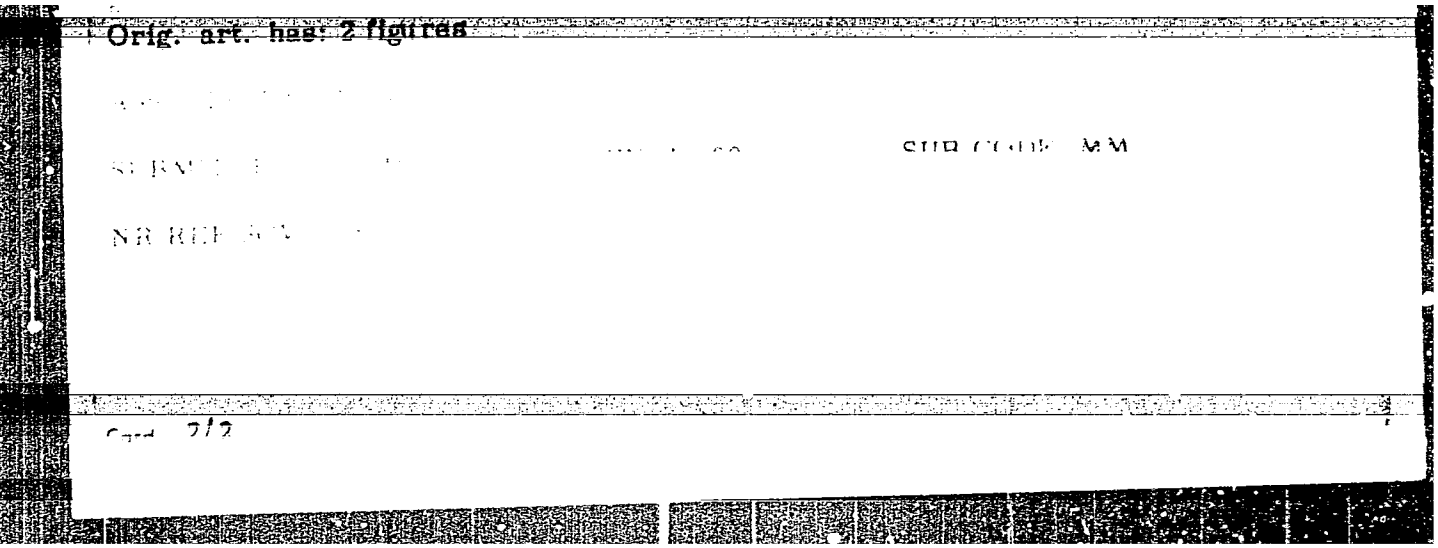
SUBMITTED: August 25, 1960



L 25152-65 EWT(m)/EWP(w)/EWA(d),T/EWP(t)/EWP(b)

creased very rapidly in the vicinity of [illegible] content increased the microhardness de-

ed by electron microscope findings. Prolonged homogenizing annealing eliminat-
ed the effect of microheterogeneity on microhardness. After annealing the solid



Orig. art. has: 2 figures

Card 2/2

ACCESSION NR: AP4022716 S/0020/64/155/002/0323/0325

AUTHOR: Vertman, A.A.; Samarin, A. M. (Corresponding member); Filippov, Ye.S.

TITLE: The density of iron, nickel and cobalt in solid and liquid state.

SOURCE: AN SSSR. Doklady*, v. 155, no. 2, 1964, 323-325

TOPIC TAGS: iron, cobalt, nickel, density, solid state, liquid state, fusion temperature, temperature density function, activation energy, fluidity density function, structure stability, interatomic distance

ABSTRACT: The densities of iron, nickel and cobalt were determined by the "large drop" method (V.N. Yermenko, Yu.V. Naydich, Fiz. met. i metalloved., No. 6, 883 (1961)) to obtain more accurate data than presently available (fig. 1). It is proposed that the increase in density in the proximity of the fusion temperatures of the metals is caused by the evolution of gases on fusion. The temperature-density function of the metals in the liquid state, calculated for the equation $\Delta V = A \exp(B/RT)$, where B is the energy of activation, is shown

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ACCESSION NR: AP4022716

in fig. 2. The break in the curve for Fe is caused by a transition to the gamma-iron structure. The fluidity-density relationship according to the formula $1/v = a - b\rho$ (ρ = density, a and b are constants) is a straight line function. The deviation (fig. 3) shows the structures do not remain constant and is associated with the atoms aligning to the structure of the solid phase. Calculations were made to show that the structure of Ni is the most stable with respect to temperature change. Interatomic distances were calculated from the densities for Ni, Co, and Fe in the liquid state. Orig. art. has: 2 tables, 3 figures and 4 equations.

ASSOCIATION: Institut metallurgii im. A. A. Baykova (Institute of Metallurgy)

SUBMITTED: 15Oct63 DATE ACQ: 08Apr64 ENCL: 02

SUB CODE: ML NR REF SOV: 005 OTHER: 007

Card 2/4

FILIPPOV, Ye.S.; VERTMAN, A.A.; SAMARIN, A.M.

Apparatus for measuring the density and surface tension of iron melts. Zav. lab. 30 no.5:620-621 '64. (MIRA 17:5)

1. Institut metallurgii imeni Baykova.

VERTMAN, A.A.; GRIGOROVICH, V.K.; NEDUMOV, N.A.; SAMARIN, A.M.

Hypereutectic part of the iron-carbon constitut[illegible] diagram. (MIRA 18:6)
Lit. proizv. no.2:27-33 F '65.

BURTSEV, V.T.; VERTMAN, A.A.; SAMARIN, A.M.; FILIPP, G.

Kinetics of gas liberation during the inoculation of liquid cast iron. Lit. proizv. no.3:25-27 Mr '65. (MIRA 18:6)

VERTMAN, A.A.; GRIGOROVICH, V.K.; NEDUMOV, N.A.; SAMARIN, A.M.

Study of the systems cobalt - carbon and nickel - carbon. Dokl. AN SSSR 162 no.6:1304-1305 Je '65. (MIRA 18:7)

1, Institut metallurgii im. A.A.Baykova. 2. Chlen-korrespondent AN SSSR (for Samarin).

VERTMAN, A.A. (Moskva); GLAZOV, V.M. (Moskva)

Microheterogeneity in the crystals of a solid solution of nickel alloys with carbon. Izv. AN SSSR. Met. i gor. delo no.6:148-150 N-D '64. (MIRA 18:3)

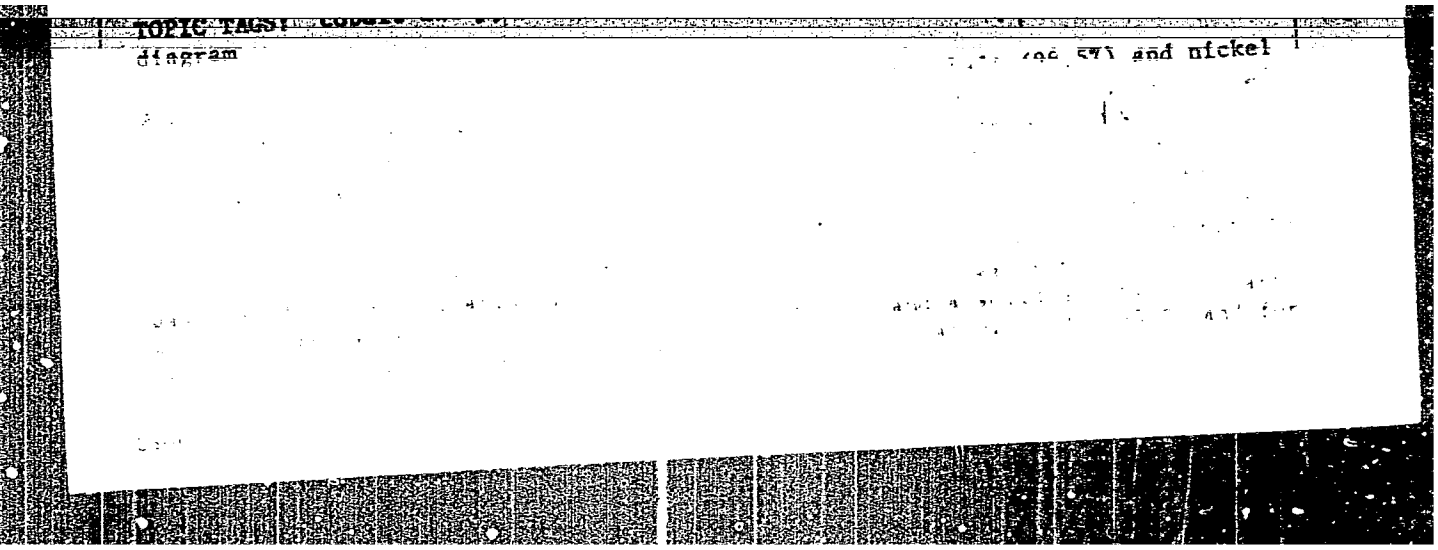
VERTMAN, A.A.(Moskva); SAMARIN, A.M. (Moskva)

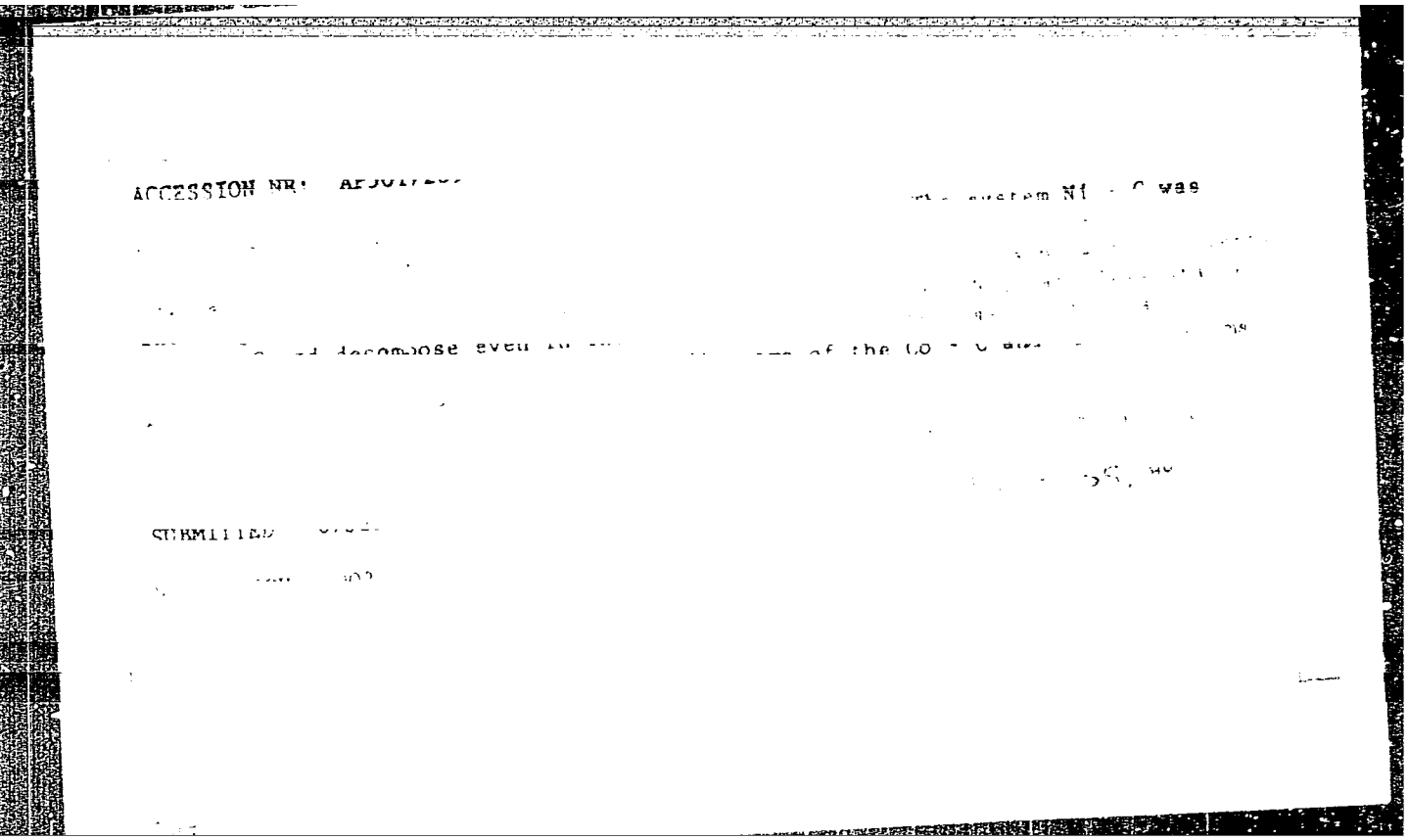
Kinetics of the dissolution of carbon in liquid iron. Izv. AN SSSR. Met. no.1:46-54 Ja-F '65. (MIRA 18:5)

FILIPPOV, Ye.S.; VERTMAN, A.A.

Connection between volumetric characteristics of molten iron and "critical concentrations." Izv. vys. ucheb. zav.; chern. met. 8 no.5:5-8 '65. (MIRA 18:5)

1. Institut metallurgii imeni Baykova, Moskva.





ACCESSION NR:

SUBMITTED:

VERTMAN, A.A.; GRIGOROVICH, V.K.; NEDUMOV, N.A.; SAMARIN, A.M.

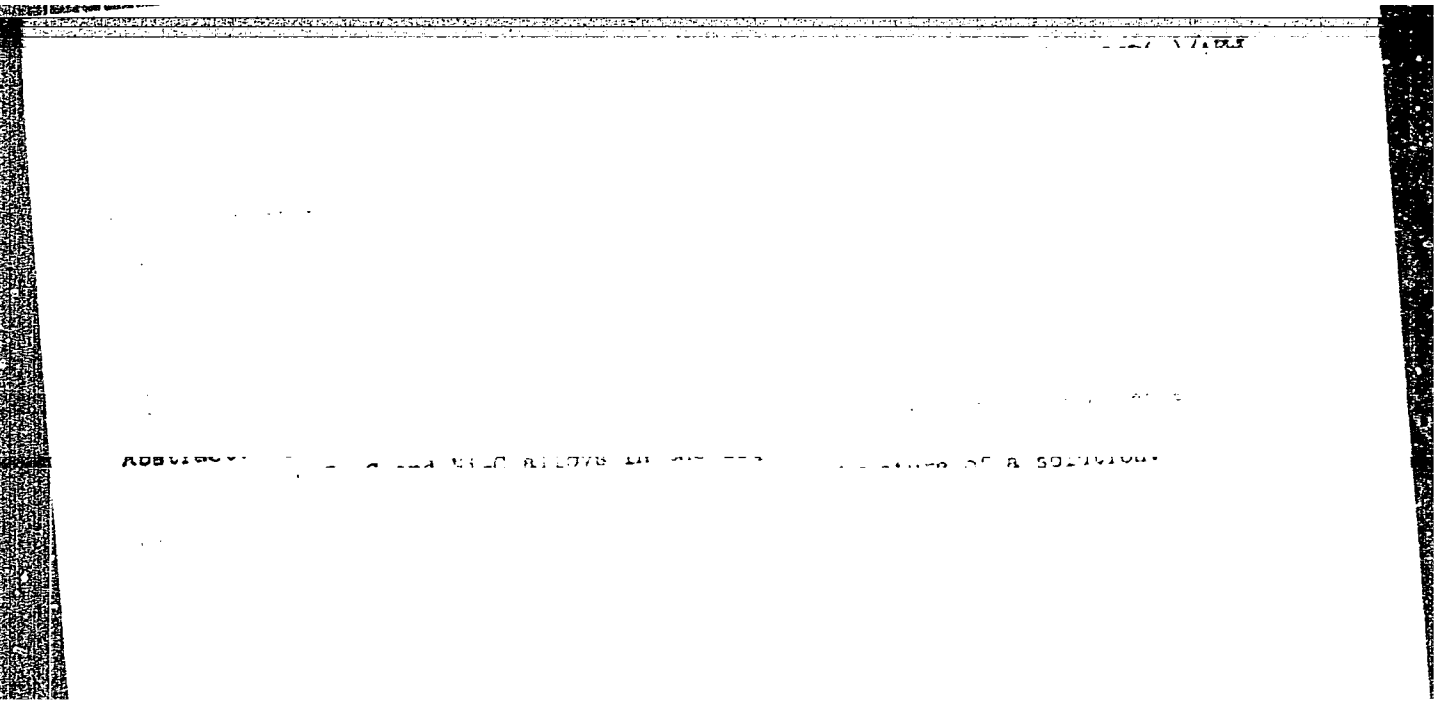
Transeutectic region of the iron-carbon system (from 2,88 to 27 Wt % of C). Dokl. AN SSSR 159 no.1:121-124 N '64. (MIRA 17:12)

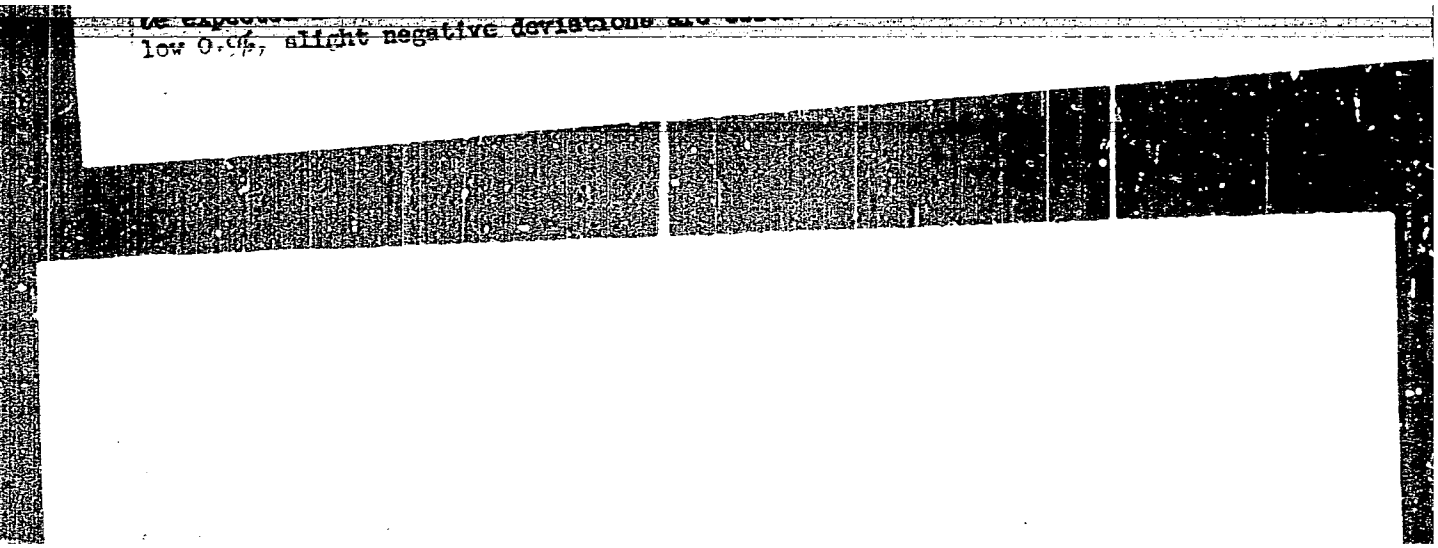
1. Institut metallurgii im. A.A. Baykova. 2. Chlen-korrespondent AN SSSR (for Samarin).

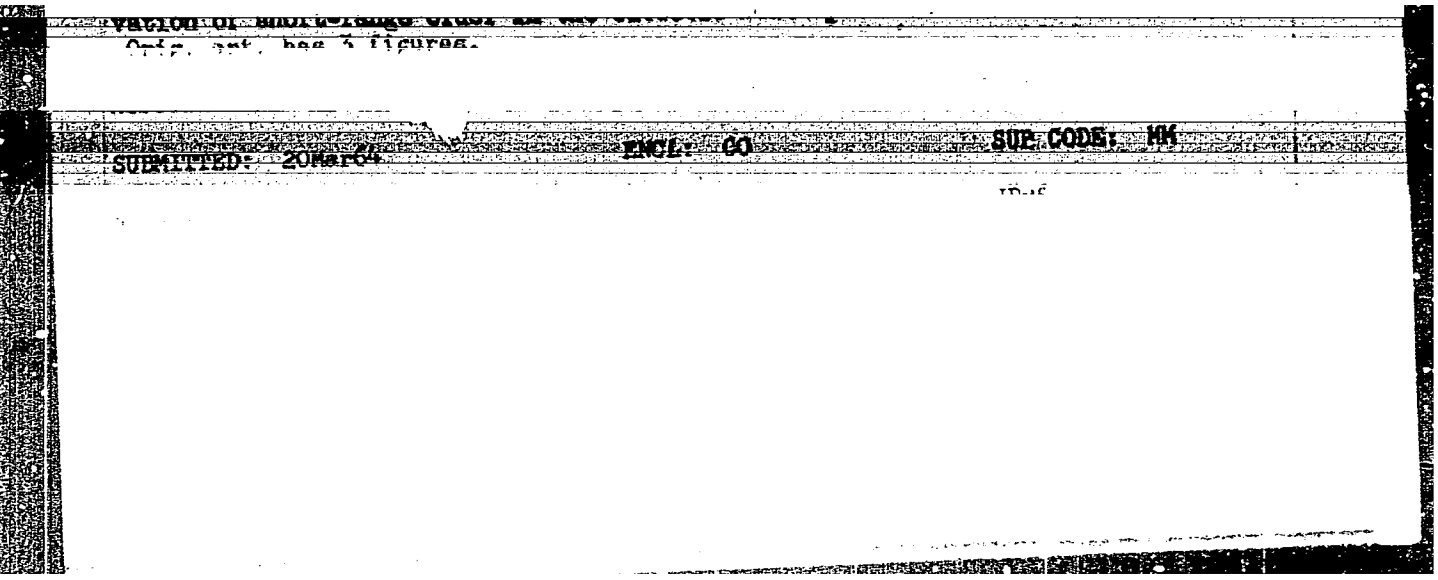
VERTMAN, A.A.; FILIPPOV, Ye.S.; SAMARIN, A.M.

Density of iron alloys with carbon in solid and liquid states.
Izv. vys. ucheb. zav.; chern. met. 7 no.7:19-23 '64
(MIRA 17:8)

1. Institut metallurgii im. Baykova.

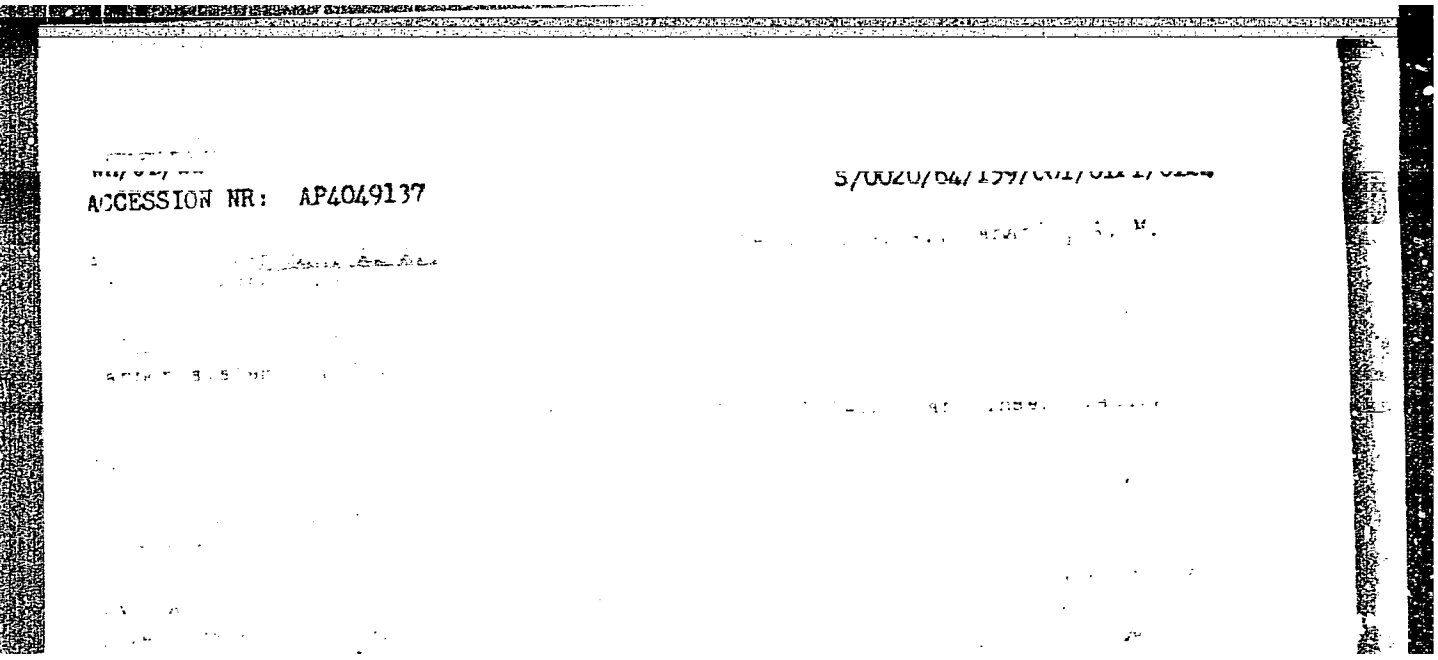



low O.[illegible], slight negative deviations



VERTMAN, A.A.; IVANOV, D.P.; SAMARIN, A.M.; FILIPPOV, Ye.S.

Changing the density of liquid cast iron by isothermal holding.
Lit.proizv. no.10:30-32 O '64. (MIRA 18:4)



ACCESSION NR: AP4049137

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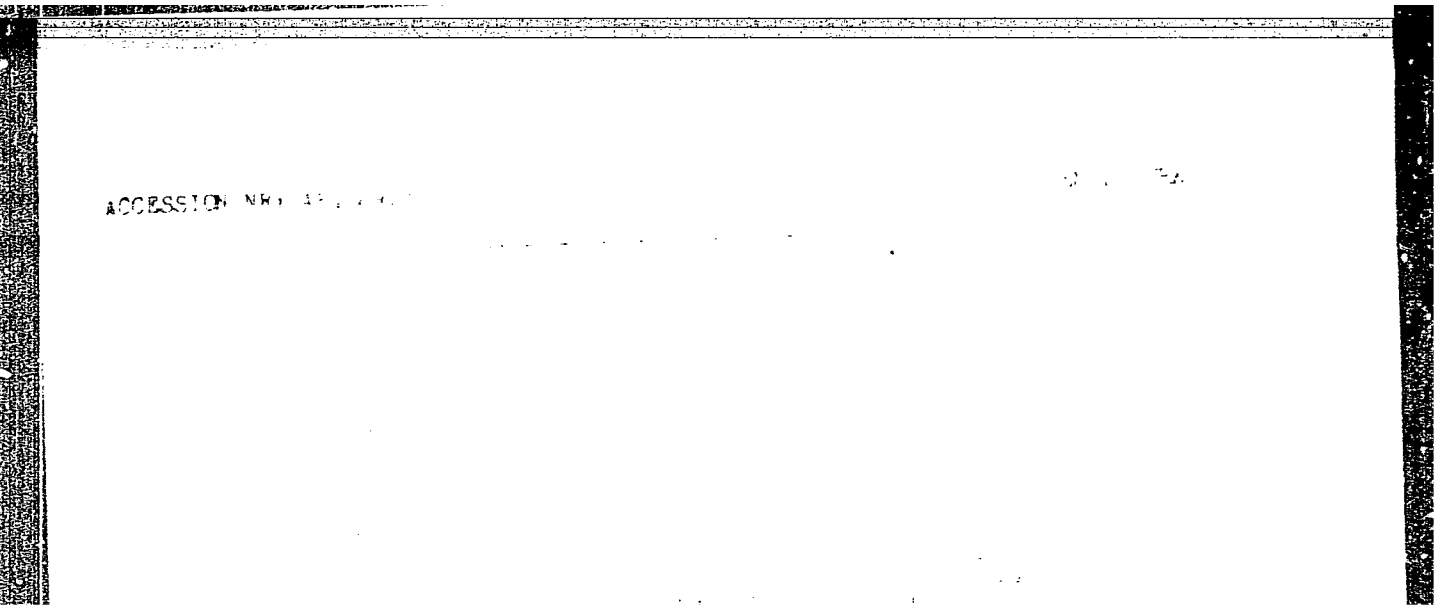
1 figure.

(Metallurgy Institute)



ACCESSION NR:

APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859530003-7"

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L 18224-65

ACCESSION NR: AP4049137 ENCLOSURE: 02

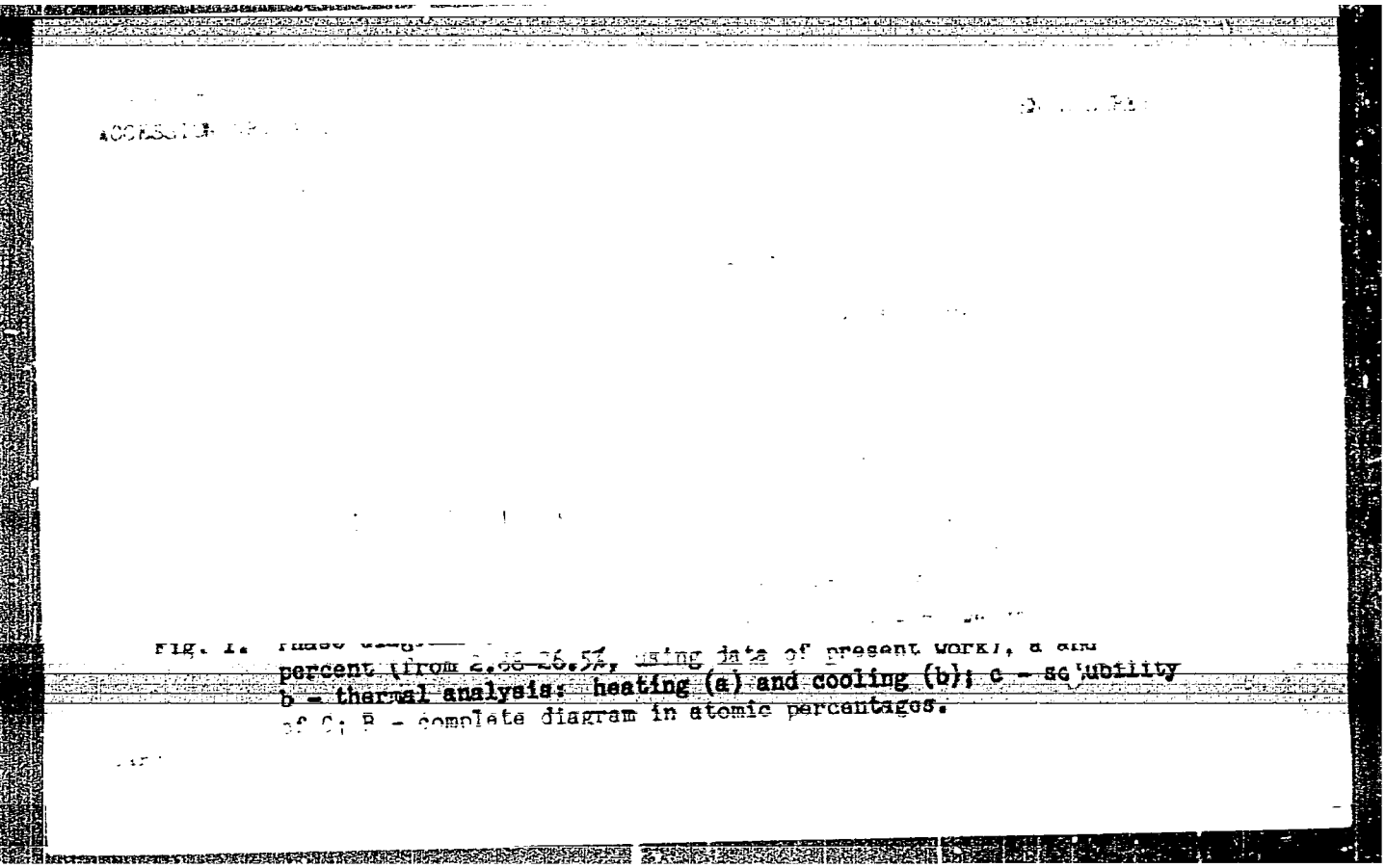

Fig. 1. [illegible] percent (from 2.66–26.5%, using data of present work), a and b – thermal analysis: heating (a) and cooling (b); c – solubility of C; B – complete diagram in atomic percentages.

VERTMAN, A.A.; MAKAROVA, S.N.

Adiabatic calorimeter for determining the heat capacity of melts. Zav. lab. 30 no.9:1151-1152 '64. (MIRA 18:3)

1. Institut metallurgii imeni Baykova.

VERTMAN, A. A.; SAMARIN, A. M.; FILIPPOV, Ye. S.

Density of iron, nickel, and cobalt in the solid and liquid states.
Dokl. AN SSSR 155 no. 2:323-325 Mr '64. (MIRA 17:5)

1. Institut metallurgii im. A. A. Baykova. 2. Chlen-korrespondent AN SSSR (for Samarin).

VERTMAN, A.A.

Conference on smelting in vacuum arc and induction furnaces. Izv. AN SSSR. Otd. tekh. nauk. Met. i gor. delo no.2:173-174 Mr-Ap '63. (MIRA 16:10)

VERTMAN, A.

Seminar on the study of the thermophysical properties of materials at high temperatures. Izv. AN SSSR. Otd. tekh. nauk. Met. i gor. delo no.4:175-176 Jl-Ag '63. (MIRA 16:10)

GLAZOV, V.M.; VERTMAN, A.A.

Characteristics of the structure of liquid eutectics and the character of viscosity - composition diagrams in systems of the eutectic type. Issl. splav. tsvet. met. no.4:85-93 '63. (MIRA 16:8)

(Eutectics) (Phase rule and equilibrium)

VERKMAN, A. A. (Moscow)

"Methods of investigation of viscosity, electric conductivity, surface tension, density, magnetic susceptibility, specific heat, and mixing heat for molten iron alloys in the 1500—2000C range."

Report presented at the Seminar on the Problems of research on thermophysical properties of substances at high temperatures, Novosibirsk, 9-10 April 1963.

VERTMAN, A. A.

Meeting of the metallurgy, metallography, mining, and ore dressing section of the Academy of Sciences, Department of Technology, devoted to the discussion of technological objectives in the light of resolutions of the 22d Congress of the CPSU. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.6:208-213 N-D '62. (MIRA 16:1)

(Metallurgy—Congresses)

EWP(q) EWT [illegible]

ACCESSION NR: AP[illegible]

AUTHOR: Vertman, A. A.

TITLE: Conference on melting in vacuum-arc and induction furnaces

SOURCE: [illegible] Izv. [illegible] Metallurgiya [illegible]
1965, 173-174

TOPIC TAGS: vacuum melting, arc melting, induction melting, chemical composition, [illegible]

electroslag melting

ABSTRACT: A conference on vacuum-arc and induction melting was held at the Institut metallurgii im. A. A. Baykova (Institute of Metallurgy) on 27-29 November [illegible]

Card 1/3

L 10793-63 27

ACCESSION NR: AP3000918

[illegible] Ya. Reznik [illegible], melting ball-bearing steel

steels and alloys [illegible]

[illegible]

[illegible] conditions of vacuum-arc melting [illegible] properties [illegible] alloys of types [illegible]

and EI929 (unidentified) [illegible] Ya. Shpunt, B. S. Lomberg, [illegible] A. Marchukova, [illegible]

Sidorov); vacuum-arc melting of EI617 (5% Fe, 2% Al, 2% Ti, 0.5% Mn, 13-16% Cr, [illegible]

[illegible] V. I. Kashin, A. M. Samarin, [illegible]

Card [illegible]

L 10793-63
ACCESSION NR: AP3000918

10

others); vacuum-pumping equipment for metallurgical furnaces (A. B. Tseytlin); experience in operating the "Cereus" vacuum-arc furnace (A. Ya. Borisov, S. K. Mikhaylov, V. L. Popkov, V. D. Solov'yev); stabilization of power conditions and improvement of current in consumable-electrode vacuum-arc furnaces [illegible], B. K. Karavashkin); mastering the operation of the OKB[illegible] vacuum-induction furnace of the 'Elektrosta[illegible]' Plant [illegible] and others). Orig. art. has [illegible] figures, [illegible] tables, and [illegible] equations.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ. 12Jun63 ENCL: 00

SUB CODE: ML NO REF SOV: 000 OTHER: 000

Card 3/3

VERTMAN, A.A.; SAMARIN, A.M.; FILIPPOV, Ye.S.

Phase diagram of Ni - C. Dokl. AN SSSR 148 no.2:342-343 Ja '63.
(MIRA 16:2)

1. Institut metallurgii im. A.A. Baykova. 2. Chlen-korrespondent AN SSSR (for Samarin).
(Nickel-carbon alloys)

VERTMAN, A. A. (Moskva); SAMARIN, A. M. (Moskva); FILIPPOV, Ye. S. (Moskva)

Viscosity and the electrical conductivity of liquid nickel-carbon alloys. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.6:37-42 N-D '62. (MIRA 16:1)

(Nickel alloys—Electric properties)
(Viscosimetry)

VERTMAN, A.A.; MCHEDLISHVILI, V.A.; SAMARIN, A.M.

Effect of deoxidation on liquid iron viscosity. Izv. vys. ucheb. zav.; chern. met. 5 no.5:34-36 '62. (MIRA 15:6)

1. Institut metallurgii Akademii nauk SSSR.
(Iron--Metallurgy)
(Viscosity)

VERTMAN, A.A.; SAMARIN, A.M.

Physicochemical properties of liquid alloys of iron, nickel, and cobalt. Trudy Inst.met. no.10:135-151 '62. (MIRA 15:8)
(Liquid metals--Testing) (Alloys--Testing)

VERTMAN, A.A.; SAMARIN, A.M.

Separation of liquid eutectics by centrifugation. Trudy Inst. met. no.10:152-154 '62. (MIRA 15:8)
(Eutectics) (Centrifugation)

VERTMAN, A.A.; SAMARIN, A.M.

Structure and properties of liquid metals. Trudy Inst.met. no.10:108-134 '62. (MIRA 15:8)
(Liquid metals—Testing)

GLAZOV, V.M. (Moskva); VERTMAN, A.A. (Moskva); SHVILKOVSKIY, Ye.G. (Moskva)

Results of the discussion on the structure and properties of liquid metals. Izv. AN. SSSR. Otd. tekh. nauk. Met. i topl. no.3:104-115 My-Je '61. (MIRA 14:7)
(Liquid metals)

VERTMAN, A.A. (Moskva); SAMARIN, A.M. (Moskva)

Viscosity of liquid alloys in the system nickel - aluminum.
Izv. AN. SSSR. Otd. tekh. nauk. Met. i topl. no.3:159-160
My-Je '61. (MIRA 14:7)
(Nickel-aluminum alloys)

S/137/61/000/008/001/037
A060/A101

AUTHOR: Vertman, A. A., Samarin, A. M.

TITLE: Physico-chemical properties of molten alloys of iron, nickel and cobalt

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 8, 1961, 5, abstract 8A43 (V sb. "Stroyeniye i svoystva zhidk. metallov." Moscow, 1960, 138-161)

TEXT: The apparatus and methods for measuring the viscosity, electric conductivity, and the magnetic permeability of molten metals are described. The structure-sensitive properties of Fe, Co, Ni, and of a system of alloys based on them and having different types of state diagrams are systematically investigated. It is noted that close packing is retained at temperatures exceeding the melting point in molten Fe, Co, Ni; the presence of a $\delta \rightarrow \gamma$ change point is hypothesized in the close-packing structure of molten Fe at 1,660°C. Upon the example of the Ag - Cu system it is demonstrated that the viscosity increases as one gets away from the eutectoid point. This is explained by the increase in the number of bonds between like particles, whose interaction in

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Physico-chemical properties of molten ...

eutectic alloys is greater than that of unlike particles. Based upon the study of particle size in eutectic alloys using a high-temperature centrifuge, the conclusion is drawn that Fe-C alloys with C content > 2.0 % are close to colloidal solutions (the particle size is of the order of 10^{-6} cm). In Ni - Si and Fe - Si systems, where a chemical interaction between the components exists, regions are observed which are not connected with the solid state and which are probably metastable complexes formed in the liquid state. Besides, in Fe - Co and Fe - Ni systems, a change is observed in the structure type in the liquid state. By comparing the gas-solubility isotherms with the structural-characteristic isotherms the presence of an interdependence between the chemical and the structural characteristics of molten metals is demonstrated. As result of the study of thermal stability of Ni silicides it is shown that disordering processes begin only at temperatures considerably exceeding the melting point. There are 38 references.

V. Shumskiy

[Abstracter's note: Complete translation]

Card 2/2

VERTMAN, A.A. (Moskva); SMARAIN, A.M. (Moskva)

Properties of liquid alloys with unlimited solubility of components in the solid state. Izv. AN. SSSR. Otd. tekh. nauk. Met. i topl. no.2:83-87 Mr-Ap '61. (MIRA 14:4)
(Alloys) (Solutions, Solid)

18 7530 1145, 1555, 1454 S/180/61/000/003/010/012
E111/E152

AUTHORS: Glazov, V.M., Vertman, A.A., and Shvidkovskiy, Ye.G. (Moscow)

TITLE: Contribution to the summary of a discussion on the structure and properties of liquid alloys

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.3, pp.104-115

TEXT: This article relates to one which appeared in No.6 of this journal, 1960. The authors state that a number of important questions remain to be clearly answered in the field of liquid-metal structures, particularly: 1) for which systems and to what extent does the nature of particle interaction forces change during transition from the solid to the liquid state; 2) how is liquid structure linked with that of the original crystal and to what temperature does the link persist; 3) what is the structural unit of various liquids; 4) can a model of liquid structure be found as universal as the crystal lattice for solids; 5) to what extent can properties of the crystallized material be influenced in a given way through the liquid. What is needed is a theory of

Contribution to the summary of a .....

the liquid state embodying the molecular-kinetic theory of phase transition. In the present survey the authors se : out to express some definite ideas on the required research programme. They have all made their own contributions (e.g. Ref.10: Ye.G.Shvidkovskiy, N.N. Rakova, Tam Zhe. Ref.12: V.M. Glazov, present journal, No.6, 1960: Ref.15: A.A. Vertman, A.M. Samarin, DAN SSSR, 1960, 134, No.2). Basic ideas (Ref.1: Ya.I. Frenkel', Sobraniye trudov, 3, Akademizdat, 1959. Ref.2: N.N. Bogolyubov, Gostekhizdat, 1946. Ref.3: I.Z. Fisher, Fizmatgiz, 1961), must be developed and extended. Diffraction methods (Ref.14: T.A. Kontorova, present journal, 1961, No.3) must be developed and supplemented by new methods. Molecular vapours of liquids could give indications of liquid structural units and crystallization, especially of super-cooled liquids, should also be studied. A systematic study is needed of electrical properties, which shed light both on changes in inter-particle forces and in structure on crystallization and melting. An attempt to link the liquid coordination number and its change on heating with the electronic structure of the atom (Ref.7: V.K. Grigorovich, Tam Zhe, 1960, No.6) is an interesting supplement to earlier ideas which are in agreement with those of

Bernal (Ref.8: Scientific American, 1960, 203, No.2). The existence of directed inter-atomic bonds complicates the picture obtained. Three cases of liquid structure have been recognized (Ref.3: and Ref.9: I.Z. Fisher, present journal, 1960, No.6) in an approach based on the idea of disturbance of the "original lattice" by thermal vibrations. A study of crystallization of supercooled tin by electrical conductivity measurement indicates the absence of any simple and obvious link between the number of crystallization centres formed and the final distance (Ref.10). Fruitful results, e.g. for germanium (Ref.12) have been obtained from a method based on changes of structure-sensitive properties with temperature. "Oriented fusion" is another view of the mechanism of metallization of the bond on fusion of germanium and silicon (Ref.13: T.A. Kontorova, FTT, 1959, V.1, No.11, 1761. Ref.14). There is some evidence of increase in the coordination number of iron on heating (Ref.15) and the possibility of polymorphic transformations has been considered (Ref.16: Yu.A. Klyachko, present journal, 1960, No.6. Ref.17: S.S. Urazovskiy, Izd. AN Ukr.SSR, 1956. Ref.18: S.F. Khokhlov, present journal, 1960, No.6). An interesting approach is the comparison of experimentally determined heats of

Contribution to the summary of a ....

fusion of silicides with those calculated by an approximate equation for a type A_mB_n intermetallide (or from entropies of fusion) (Gel'd, P.V, Korshunov, V.A., and Petrushevskiy, M.S., Tam Zhe, Ref.19; Gel'd, P.V., and Kocherov, P.V., Tam Zhe, Ref.20). A "geometrical" approach to liquid structure based on structural crystallography has also been made (Ref.18). Fedorov's theory of space groups can be used in connection with the possibility of formation of quasi-compounds with a structure which in general has no analogues in the solid state (e.g. Refs. 21: M.I.Shakhparonov, Tam Zhe, 1961, No.3; Ref.5: O.Ya. Samoylov, Izd. AN SSSR, 1957: Ref.22: V.M. Glazov, S.N. Chizhevskaya, Tam Zhe, 1961, No.3). Mass spectroscopy of vapours and study of condensate structures has shown the possibility of polyatomic formation in the vapour (Ref.23: G.M. Martynkevich, Tam Zhe, 1960, No.6). At near-liquidus temperatures, the discussion showed, there is a close-order structure which is generally only qualitatively related to the phase diagram. For classifying liquids the energy of inter-particle interaction or some related value should be used. Deviations from ideal-solution laws are a possible index (Ref.24: Yesin, Yu.A., Sryvalin, I.T., Tam Zhe), as are composition versus

property curves. The latter has been used for a system of classification (Ref.25: F.Zauerval'd, Tam Zhe, 1961, No.3) which is only partially successful, and Kurnakov's system (Ref.26: N.S. Kurnakov, Izd. AN SSSR, 1940) is still useful. With a few exceptions (Ref.27: Yu.A. Nekhendzi, N.G. Girshovich, present journal, 1961, No.3, and Ref.28: A. Grbek, Tam Zhe) the participants in the discussion preferred isotherms to lines of equal superheat. The structure of liquid eutectics was widely discussed, three main points of view being apparent. The first, originated by Danilov (Ref.4: V.I. Danilov, Izd.AN Ukr.SSR, 1956), regards melts of eutectic composition as containing a more or less developed chemical microheterogeneity (Ref.29: A.S. Lashko, A.V. Romanova, Tam Zhe: Ref.30: V.M. Glazov, A.A. Vertman, Izd.AB SSSR, 1960); experimental confirmation is available (Ref.31: A.R. Regel', F. Gaybullayev, ZhTF, 1957, V.27, No.9: Ref.24). The average size of these eutectic colonies is considered to be 10^3 - 10^4 atoms (confirmed in Ref.33: A.A. Vertman, A.M. Samarin, A.M. Yakobson, Tam Zhe) and their composition close to that of the corresponding solid solution (Ref.32: G.M. Bartenev, present journal, 1961 No.3).

Another view (Ref.28) is based on that of Haveling (Geveling) that the liquid eutectic is a compound decomposing on crystallization. Chemical microheterogeneities, however, are not developed in all systems (Ref.30). Although the energy of mixing of liquid eutectics is almost always positive and thus favours the possibility of their development, this has been experimentally confirmed (e.g. Refs. 4, 29, 33 and 34; K.P. Bunin, Izv.AN SSSR, OTN, 1946, No.2). The view that negative deviations from ideality arise in all Me-Si systems (Ref.24) is incorrect. There was comparatively little discussion of the structure of chemical compounds in the liquid state. The only clear fact on this is that strong bonds in the solid state tend to persist into the liquid: this has much experimental support (Refs. 25, 26, and Ref.35: A. Roll', present journal, 1960 No.6; Ref.36: E. Gebhardt, M.Becker, Z.Metallkunde, 1955, 46, 90; 1955, 46, 669; Ref.37: D.K. Belashchenko, present journal, 1960 No.6; Ref.38: V.M.Glazov, Tam Zhe, 1960, No.5; Ref.39: A.A. Vertman, A.M. Samarin, Izd. AN SSSR, 1960; Ref.40: A.A. Vertman, V.M. Glazov, present journal, 1959, No.1). From experimental data (Ref.41: A.F. Skryshevskiy, Tam Zhe, 1960, No.6. Ref.42: V.M. Glazov, A.A. Vertman, DAN SSSR,

Contribution to the summary of a ...

1958, V.123, No.3. Ref.43: V.M. Glazov, D.A. Petrov, DAN SSSR, 1958, V.120, No.2. Ref.44: V.M. Glazov, D.A. Petrov, Izv. AN SSSR, OTN, 1958, No.4), Skryshevskiy concluded that chemical compounds melt without appreciable dissociation and remain fairly stable above the melting point. But this does not apply to Au-Sn (Ref.45: A.S. Lashko, DAN SSSR, 1959, V.125, No.1). Additional information is provided by surface-tension (Ref.19) and viscosity (Ref.46: V.N. Yeremenko, V.I. Nizhenko, Yu.V. Naydich, present journal, 1961, No.3) data. Interaction between elements in ternary alloys was also considered (Ref.48: V.M. Glazov, Izv. AN SSSR, 1960). The discussion showed the need for a thorough study of composition - property relationships.
There are 48 references: 46 Soviet, 1 German and 1 English.
The English language reference reads as follows:
Ref.8: J.D. Bernal, Scientific American, 1960, 203, No.2.

SUBMITTED: March 18, 1961

Card 7/7

S/180/61/000/003/011/012
E073/E535

18.7530 1555, 1454, 1418

AUTHORS: Vertman, A.A. and Samarin, A.M. (Moscow)

TITLE: Viscosity of Liquid Alloys of the System Nickel-Aluminium

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.3, pp.159-160

TEXT: Chemical interactions in liquid solutions are apparently an indication of the strong bond in solid solutions and permi\ determining the form in which an alloying component is present. From this point of view it is of interest to investigate nickel-aluminium alloys which form the basis of numerous important high temperature alloys. With the exception of a paper by V. N. Yeremenko, V. I. Inzhenko and Yu. V. Naydich (Ref.1: Izv. AN SSSR, OTN, Metallurgiya i toplivo, 1961, No.3) the authors are not aware of any other published work on the subject. Nickel-aluminium alloys were smelted in a high frequency vacuum furnace with a residual pressure of 10^{-4} mm Hg, using 99.9% purity nickel and high purity aluminium. The viscosity was determined by means of a viscosity meter, described earlier, in a pure helium atmosphere which was passed through activated carbon at the boiling

Viscosity of Liquid Alloys of the ... S/180/61/000/003/011/012
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temperature of liquid nitrogen. The viscosity was calculated according to the method of Shvidkovskiy; the obtained results on the kinematic viscosity of liquid NiAl alloys in the temperature range 1600-1700°C are presented in a graph. The temperature dependence of the viscosity in this system is slight and, therefore, it can be assumed that the viscosity curve applies to the temperature range 1600-1700°C. The single maximum for the NiAl composition and the absence of any influence on the viscosity of the Ni_3Al compound which forms as a result of the peritectic reaction is of interest. The single maximum on the viscosity curve shows that the near-order structure characteristic for the NiAl compound is maintained in the liquid state. Judging from the value of the maximum on the kinematic viscosity curve the NiAl dissociates little in the investigated temperature range. Apparently the chemical interaction in alloys corresponding to NiAl is so large that these can be considered as stable groupings. On the other hand, Ni_3Al does not show any influence on the viscosity of the melt, which is attributed to the presence of a wide temperature range between the liquidus and the solidus, as

a result of which the hereditary structure of the solid phase is not conserved in the formed homogeneous liquid solution. The data obtained by the authors confirm the results obtained by Yeremenko in measuring the surface tension (Ref.1). An exception is their conclusion on partial dissociation of NiAl in the melt. Apparently it is correct to consider that NiAl is an extremely strong compound for which the degree of dissociation in the temperature range under investigation is negligible. To study the thermal stability of NiAl in the melt a series of tests were carried out with levitation melting followed by quenching in a copper mould. The specimens were in the form of a hollow nickel ampoule with a threaded-in lid, inside which a stoichiometric quantity of Al was placed. As a result of heating of the nickel ampoule in the magnetic field, the aluminium melts. As soon as the nickel melts there will be an intensive reaction of combination of Al with Ni which is accompanied by a sudden rise in the temperature by 300-400°C. The reaction was made easier by the intermixing of the metal in the magnetic field. Apparently the chemical interaction between the Ni and the Al is so strong that the NiAl forms almost instantaneously and is very stable in the liquid state up to fairly high temperatures.

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There are 1 figure and 2 Soviet references.

SUBMITTED: March 18, 1961

[Abstractor's Note: This is an almost complete translation.]

Figure

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VERTMAN, A.A. (Moskva), SAMARIN, A.M. (Moskva), TUROVSKIY, B.M. (Moskva)

Structure of liquid alloys in the system iron - carbon. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.6:123-129 N-D '60. (MIRA 13:12)

(Liquid metals) (Iron alloys)

S/148/62/000/005/001/009
E071/E135

AUTHORS: Vertman, A.A., Mchedlishvili, V.A., and Samarin, A.M.

TITLE: The influence of deoxidation on the viscosity of molten iron

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.5, 1962, 34-36

TEXT: The effect of deoxidation of steel by a deoxidising element depends to a considerable extent on the velocity of flotation of products of the deoxidising reaction. Since there are no direct methods of measuring the velocity of flotation of non-metallic inclusions from a liquid metal, the authors attempted to evaluate this velocity from results of changes in the kinematic viscosity of liquid iron during its deoxidation with silicon and aluminium. The viscosity was determined from the torsional vibrations of a cylinder filled with the liquid investigated. The experiments were carried out at 1600 °C with additions of 0.1 and 1.0% Si and 0.5 and 1.0% Al to armco iron, in an atmosphere of purified helium in a furnace with graphite heating elements, so as to exclude the possibility of reoxidation.
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In all the experiments addition of the deoxidant resulted first in an increase of the viscosity, due to heterogenisation of the liquid metal caused by the formation of deoxidation products; this was followed by a steady decrease in viscosity which approached its initial value for pure iron. The time taken to reach the initial viscosity after the addition of a deoxidant can serve as a measure of the velocity of flotation of deoxidation products. The duration of flotation of products formed on the addition of 0.5 and 1% Al was 2-3 minutes. On adding 0.1% Al the velocity of flotation decreased considerably: the initial viscosity was not attained after a considerable time (25 minutes). Addition of 1% Si had a similar effect; on adding 0.1% Si the velocity of flotation is considerable, after about five minutes the deoxidation products were removed. This confirms that the deoxidation with large quantities of aluminium is more effective than deoxidation with silicon or small additions of aluminium. There are 2 figures.

ASSOCIATION: Institut metallurgii AN SSSR
(Institute of Metallurgy, AS USSR)

Card 2/2
SUBMITTED: October 4, 1961

VERTMAN, D.A., inzh.

Metal scaffolding for work at great heights. Energetik 12 no.7: 24-25 Jl '64. (MIRA 17:9)

VERTMAN, D.A., inzh.

Mechanization of work in fuel supply departments. Elek. sta. 35 no. 4:21-24 Ap '64. (MIRA 17:7)

VERTMAN, D.A., inzh.; TSAREV, A.N., inzh.

Dismantable metal scaffolding for repair operations in the furnaces of large boilers. Elek. sta. 35 no.6:79-80 Je '64. (MIRA 18:1)

VERTOGRADOV, D.

Selenium rectifier for tin electrolysis. Mias. ind. SSSR no.2:51 '57.
(MLRA 10:5)

1. Tallinskiy myasokombinat.
(Electric current rectifiers) (Electrolysis)

SPIRIDONOV, Nikolay Spiridonovich; VERTOGRADOV, Vladimir Ivanovich; KAMENETSKIY, Yu.A., kand. tekhn. nauk, retsenzent; FEDOTOV, Ya.A., retsenzent; VOLKOVA, I.M., red.

[Drift transistors] Dreifovye tranzistory. Moskva, Sovetskoe radio, 1964. 304 p. (MIRA 17:10)

VERTNYAKOV, A.A.

KECHIN, P.T.; VERTNYAKOV, A.A., agronom.

Toward steady high yields. Zemeldelie 4 no.8:90-94 Ag '56.
(MLRA 10:1)

1. Agronom kolkhoza imeni Stalina, Verkhne-Ural'skogo rayona, Chelyabinskoy oblasti (for Kechin).
(Verkhne-Uralsk district--Grain)

VERTOGRADOV, A.V.

Twelve days in Japan. Gor. khoz. Mosk 34 no.8:34-37 Ag '60.
(MIRA 13:9)

1. Zamestitel' zaveduyushchego Otdelom vneshnikh snosheniy Mosgorispolkoma.
(Japan--Municipal services)

VERTOGRADOV, V.I.

10 июня

(с 18 до 22 часов)

В. И. Самойленко

Тепловые режимы полупроводниковых приборов.

В. И. Вертоградов

Исследование и расчет температурной зависимости параметров полупроводниковых триодов дрейфового типа

Ю. Р. Носов,
В. И. Хазанов

Осуществление температурной стабилизации усилителя напряжения на полупроводниковых триодах различных типов.

М. А. Абдюханов

О зависимости параметров сплавных полупроводниковых триодов от тока эмиттера

В. Н. Яковлев

Шумы в полупроводниковых усилителях.

11 июня

(с 10 до 16 часов)

Г. Н. Берестовский

Статические характеристики и переходные процессы в полупроводниковом триоде при больших сигналах

Т. М. Агаханян,
В. Н. Кулешов

Исследование особенностей работы спусковой схемы на плоскостных полупроводниковых триодах при емкостном запуске в зависимости от параметров триодов

А. Ю. Гордонов

Расчет усилительного каскада на транзисторах.

В. А. Кузнецов

О влиянии режима питания в полупроводниковых триодах на работу импульсных схем.

11 июня

(с 18 до 22 часов)

Ю. Ф. Адлер,
К. Я. Сенаторов,
С. М. Чудинов

Об объемном заряде в электрическом поле в базовой области сплавного триода.

К. С. Ржевкин

Влияние неоднородности толщины базы на характеристики сплавного триода.

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORiE), Moscow, 8-12 June. 1959

31838
S/194/61/000/010/058/082
D239/D301

9,4310 (1139,1143,1159,1150)

AUTHOR: Vertogradov, V.I.

TITLE: Influence of temperature on the physical parameters of drift transistors

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 10, 1961, 16, abstract 10 D104 (V sb. Poluprovodnik. pribory i ikh primeneniye, no. 6, M., Sov. radio, 1960, 177-199)

TEXT: The temperature dependence is considered of physical parameters of a drift-transistor over the range -100 to +100°C with carrier concentration 10^{15} - 10^{18} cm^{-3}, and exponential distribution of dope in the base. On the basis of the formulae of Prince and Conwell-Weisskopf and experimental curves of the dependence of hole-mobility on dope concentration, an approximate formula is obtained for the dependence of carrier mobility on temperature in the base. The mean carrier mobility does not depend on the base-width

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